EVALUATION OF eTEP (EXTENDED TOTALLY EXTRA-PERITONEAL APPROACH) APPROACH IN INGUINAL HERNIA REPAIR

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Dedicated

to

my Family

&

Teachers

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ABBREVIATIONS

BPH	Benign Prostate Hypertrophy
BMI	Body Mass Index
COPD	Chronic Obstructive Pulmonary Disease
CHF	Congestive Heart Failure
eTEP	Extended view totally Extraperitoneal repair
IPOM	Intraperitoneal Onlay Mesh repair
ISAP	International Association for the Study of Pain
POD	Post-operative Day
POST-OP	Post Operative
TEP	Totally Extraperitoneal repair
TAPP	Transabdominal Preperitoneal Repair
UTI	Urinary Tract Infection
VAS	Visual Analog Scale

ABSTRACT

Introduction: The extended view totally extraperitoneal approach (eTEP) is a novel approach for the repair of inguinal hernia. There is rapid and easy creation of extraperitoneal domain with large operative space and flexible port set up, an increased field for dissection and mesh placement, and improved tolerance of pneumoperitoneum.

Aim of Study: To study the efficacy, safety, outcome, and complications of the eTEP approach in the repair of inguinal hernia

Materials & Methods: A prospective time-bound observational and descriptive study of 50 patients who underwent eTEP repair of inguinal hernia between 1st January 2020 to 31st June 2021 at DMC&H Ludhiana were included in this study and followed up at least for a minimum period of 3 months

Result – In our study on 50 patients with an inguinal hernia who were operated by the eTEP approach, all 50 were males, 18(36%) patients had a right-sided hernia, 13(26%) patients had a left-sided hernia and 19(38%) patients had B/L inguinal hernia. None of the cases had to be converted to open/TAPP, 32(64%) patients started ambulating on POD-1, 37(74%) patients were discharged from hospital by POD-2, post-op seroma formation was seen in four cases which were managed conservatively, no patient developed surgical site infection, no recurrence was recorded in our study at a minimum follow up of 3 months duration. There was a significant reduction in chronic pain postoperatively and it was seen in 4 patients which were mild and relieved with an oral analgesic.

Conclusion – In our study on 50 patients operated by the eTEP approach for inguinal hernia, we conclude that it is a safe approach with fewer complications, better outcomes, and cosmesis. Extraperitoneal placement of mesh avoids serious bowel complications like enterocutaneous fistula formation. Significant reduction in post-operative pain, hernia recurrence rates besides the shorter learning curve for the young surgeon make this an attractive treatment approach for repair of inguinal hernia worldwide.

Keywords: Inguinal hernia, Enhanced-view totally extraperitoneal technique, seroma, chronic pain

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INTRODUCTION

The term laparoscopy was coined by Hans Christian Jacobeans of Sweden in 1911.

The laparoscopic examination of the abdominal cavity was introduced by G. Kelling in 1901, using a cystoscope inserted under local anesthesia.

Alfred Cushieri and George Berci suggested the utility of laparoscopic exploration to minimize non-therapeutic, negative laparotomies and applied laparoscopic examination for evaluation of penetrating and blunt abdominal traumas. They also promoted interventional general surgical laparoscopy, notably, intra-abdominal adhesiolysis and laparoscopy-guided cholecystectomy.

In the 21st century, Intervention laparoscopy no longer occupies a small niche in abdominal surgeries. It is estimated that currently more than 30% of all abdominal surgeries are performed laparoscopically. As new laparoscopic procedures are being done with near perfection, many experts believe that within the next few decades approximately 80% of all abdominal surgeries will be performed using laparoscopic techniques.

The main and overtly apparent advantages of less post-op pain, tissue scarring, post-op hospitalization were incentive enough to pursue this novel technique, despite early controversies regarding surgeon training and complications related to lack of experience with this new technique. This success, as expected, lead to the application of laparoscopy to other procedures and regions, though with not so promising early results, yet this remains the most thrilling area of interest among surgeons. Management of inguinal hernia is one such rapidly developing field.

Inguinal hernia repair is one of the commonest surgical procedures done worldwide. Irrespective of country, culture, race, or socioeconomic status, inguinal hernias consist of a major health care drain throughout the world. Given the number of hernias repaired annually, it is important to recall the words of Wakeley, who said — “a

surgeon can do more for the community by operating on hernia cases, and seeing that his recurrence rate is lower than he can by operating on cases of malignant disease".[1]

The quick changes that have been witnessed in hernia repair techniques including the use of prosthetic materials and laparoscopic approach to hernias have made hernia surgery, an appealing field that demands complete discipline and devotion of the surgeon. Though a variety of techniques are used for repair, none can be termed as an ideal technique as each one is accompanied by its own early and late complications.

The surgical technique used to repair an inguinal hernia should be tailored according to the surgeon's characteristics and local and regional resources as well as the characteristics of the patient and hernia. The surgeons should be competent in an anterior mesh technique (Lichtenstein), a posterior open mesh technique, a non-mesh alternative(Herniorapphy), and most laparoscopic techniques to offer an individual patient the option he or she needs and selects and be able to convert from one technique to another when necessary.

Laparoscopic techniques are superior for decreased postoperative pain and chronic pain and a faster return to normal activities. Laparoscopic techniques are probably also cost-effective and very safe when performed by experienced surgeons, especially those performing high-volume laparoscopic surgeries. Hence, under appropriate conditions, the laparoscopic approach is a first-line approach for the repair of inguinal hernias in the modern clinical scenario.

In our institution, inguinal hernia repair is one of the frequent surgeries performed daily. This study aims at studying the competence, advantages, complications, post-operative pain, and duration of hospital stay and to see the results of the eTEP approach in inguinal hernia repair.

AIMS AND OBJECTIVES

To study the efficacy, feasibility, post-operative mobilization, duration of hospital stay, outcomes, and complications like post-op pain, seroma formation surgical site infection, and recurrence following eTEP repair of inguinal hernia.

REVIEW OF LITERATURE

A hernia is a protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity. A hernia is derived from the Greek word „Hernios" a bulge or an off shoot. It was defined by sir Astley cooper (1804) as a protrusion of any viscus from its proper Cavity.

An inguinal hernia is a bulging of the contents of the abdomen through a weak area in the lower abdominal wall. Inguinal hernias can occur at either of two passages through the lower abdominal wall, one on each side of the groin. These passages are called inguinal canals. Groin hernias can also occur through two deeper passages in the groin called the femoral canals. Hernias through these passages are also known as femoral hernias. [2]

Inguinal hernias most often contain fat or part of the small intestine. In females, inguinal hernias may contain part of the female reproductive system, such as an ovary. When an inguinal hernia occurs, part of the peritoneum—the lining of the abdominal cavity—bulges through the abdominal wall and forms a sac around the hernia.

A sliding hernia is a protrusion through an abdominal wall of a retroperitoneal organ. The frequency of sliding hernias is estimated at 6-8% of all elective inguinal hernia repairs. Inguinal hernias may slide in and out of the abdominal wall. [3]

ELEMENTS OF INGUINAL HERNIA[4,5]

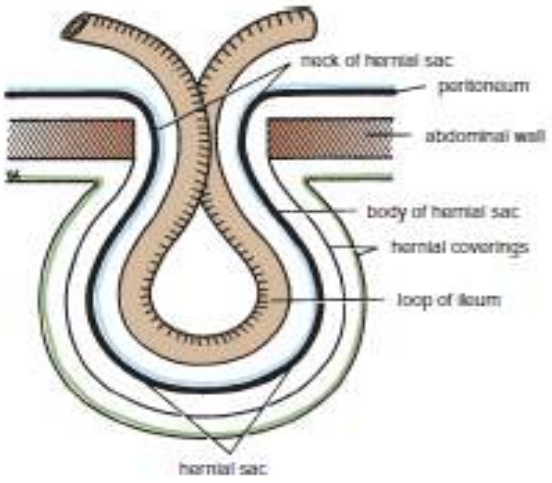

FIGURE 1 ELEMENTS OF HERNIA

The sac: Different parts of the Hernial sac

a) Mouth: This is an alleyway between the sac interior and the abdominal cavity

b) Neck: This is the narrowest part between the mouth and body of the sac

c) Body: It lies between the neck and the fundus

d) Fundus: This is the blind end or the distal-most part of the sac.

Contents of Hernia: These can be almost any abdominal viscous, but liver.

Coverings:

Coverings of an indirect inguinal hernia are (from inside out) as follows:

- Extra peritoneal fatty tissue
- Internal spermatic fascia
- Cremaster fascia
- External spermatic fascia
- Two layers of the superficial fascia
- Skin

In case of direct inguinal hernia the coverings are as follows:

- Extra peritoneal fatty tissue
- Fascia transversalis
- Conjoint tendon
- External oblique aponeurosis
- Two layers of superficial fascia and skin

CLASSIFICATION OF INGUINAL HERNIAS [4-10]

Anatomical classification[4,5]

In this category of classification, the position of the hernial sac to some anatomical structures is noted and thus the hernias are classified.

- A direct inguinal hernia protrudes through the inguinal floor—defined by Hesselbach's triangle, the pubic tubercle, the lateral border of the rectus, and the inguinal ligament—and accounts for one-third of all inguinal hernias.

- An indirect inguinal hernia protrudes through the internal inguinal ring and may descend through the inguinal canal and accounts for about two-thirds of all inguinal hernias.
- Direct hernias typically develop only in adulthood and are more likely to recur than indirect hernias.

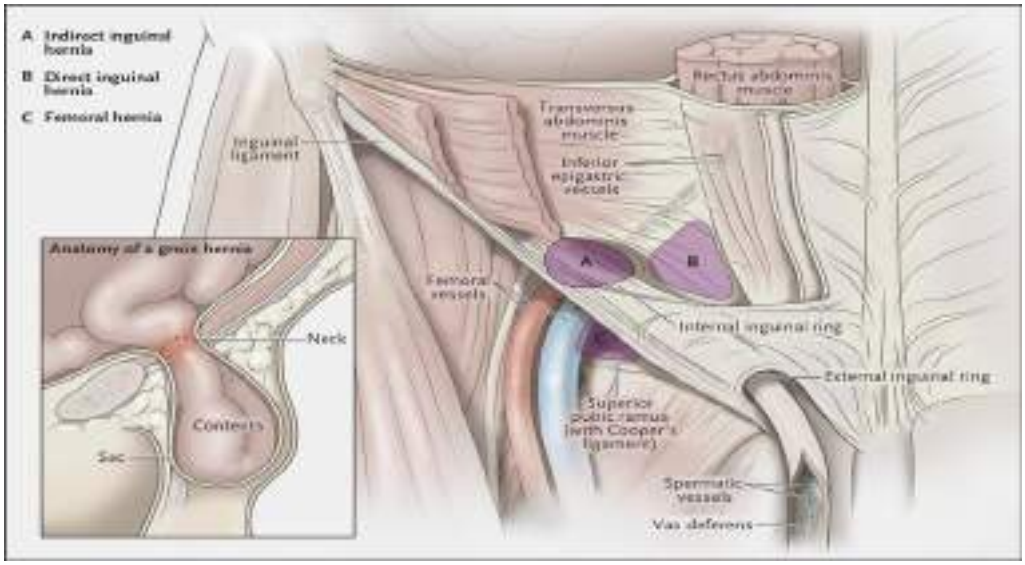

FIGURE 2 ANANTOMY OF INGUINAL CANAL

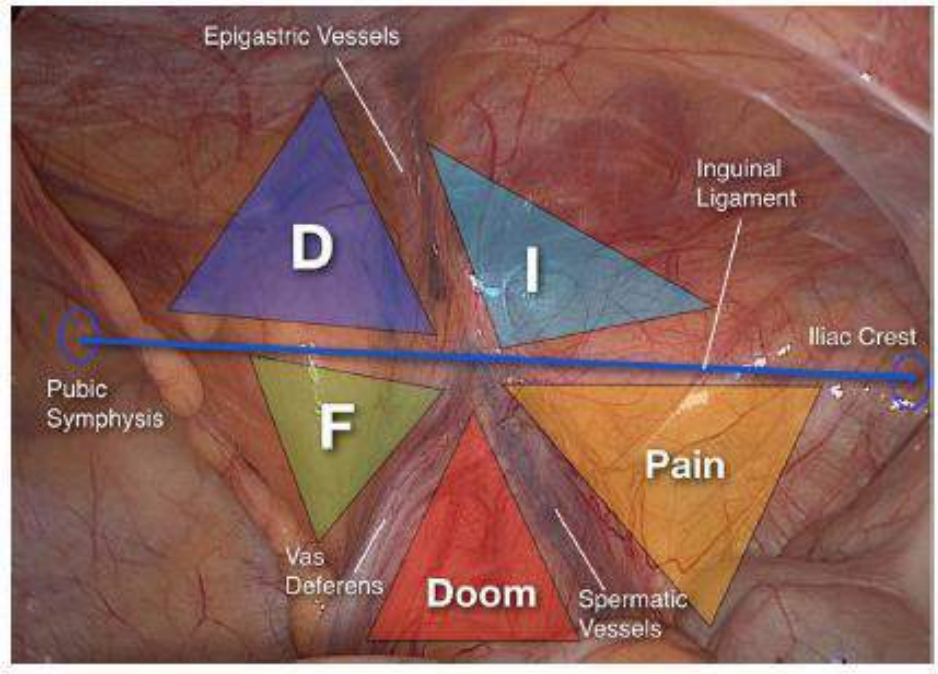

FIGURE 3 ANATOMY OF GROIN AS SEEN IN eTEP,

D- AREA OF DIRECT HERNIATION (MEDIAL TO EPIGASTRIC VESSELS)

I – AREA OF INDIRECT HERNIATION (LATERAL TO EPIGASTRIC VESSELS)

F- AREA OF FEMORAL HERNIATION

TRIANGLE OF DOOM AND PAIN

In the case of inguinal hernia, the reference point is the inferior epigastric artery. Hernia lying medial to this artery is called a direct hernia and that lying lateral to it is an indirect hernia.

CLASSIFICATION ACCORDING TO DESCENT OF THE SAC[5]

1. **Bubonocoele:** The hernia is limited to the inguinal canal
2. **Funicular:** In this type, the sac crosses the superficial ring but does not reach the bottom
3. **Complete**: When hernia descends to the bottom of the scrotum

Classification depending on the contents of the hernia

- Omentocele or epiplocele- when sac contains omentum.
- Ritcher‘s Hernia- when the sac contains a part of the circumference of the intestine.
- Littre‘s Hernia- the sac contains Meckel‘s diverticulum.
- Enterocele- when the sac contains coils of intestines.
- Cystocele- when the sac contains the urinary bladder.
- Sliding or hernia en-glissade(Contents- caecum, urinary bladder)
- Maydl‘s Hernia or Hernia-en-w(Contents-w-shaped loop of intestine)
- Hernia of the vermiform appendix (amyand hernia)
- Hernia containing female reproductive organs.
- Dual hernia (saddle or pantaloon)- Hernia on either side of the epigastric vessel

CLINICAL CLASSIFICATION[5]

This is based on the clinical appearance of hernia.

Reducible Hernia: In this contents of the sac totally get reduced into the peritoneal cavity on their own or with manipulation. A reducible hernia gives an expansile impulse on coughing.

Irreducible Hernia: When the content of the sac cannot be completely emptied from the sac. This can occur due to adhesions, tapering of the

neck, or fixity of the contents of the sac.

Obstructed Hernia (syn. Incarcerated hernia)**:** Irreducibility and Features of intestinal obstruction. In this type of hernia, there is no compromise of blood flow to the sac and its contents.

Strangulated Hernia: Irreducibility, Features of intestinal obstruction, and arrest of blood supply to its contents leading to gangrene.

Inflamed Hernia: Occurs when its contents such as an appendix, a salpinx, or a Meckel‘s diverticulum become inflamed

Nyhus Classification, 1993[10]

In 1993, Nyhus published a new system for the classification of inguinal hernias that he believed would —aid in surgical decision making and matching the type of hernia with specific operations.

Type I Indirect inguinal hernia- internal abdominal ring normal; typically in infants, children, and small adults.

Type II Indirect inguinal hernia- internal ring enlarged without impingement on the floor of the inguinal canal; does not extend to the scrotum

Type IIIA Direct hernia- size is not taken into account

Type IIIB Indirect hernia that has enlarged enough to encroach upon the posterior inguinal wall; indirect sliding or scrotal hernias are usually placed in this category because they are commonly associated with the extension to the space; also includes pantaloons hernias.

Type IIIC Femoral hernia

Type IV Recurrent hernia, modifiers A-D are sometimes added, which correspond to indirect, direct, femoral, and mixed respectively

THE BIOMECHANICS OF HERNIA FORMATION

Out of all hernias, an inguinal hernia is the most common, and inguinal hernia repair is the commonest surgery performed by a surgeon. It is likely that more than 20 million groin hernia repairs are performed every year universal. Of these, nearly 800,000 are inguinal hernia repairs performed in the USA [11]

Based on large-scale studies it was found that inguinal hernia has multifactorial etiology and affects both sexes and any age group. As

many as 30% of the patients presenting with an inguinal hernia are asymptomatic and up to 50 % of the patients are naive of their inguinal hernia. [12] Less than 5 % of patients diagnosed with inguinal hernia experience incarceration if a non-operative strategy is chosen. [13] Emergency procedures account for 5–10 % of all inguinal hernia repairs and are almost solely performed due to incarceration.[14] In women, femoral hernias account for 15 % of elective groin hernia repair, whereas 53 % of emergency groin repairs are femoral. In men, the same trend is observed, as elective femoral hernia repair makes up less than 1 % of all groin hernia repairs, compared to 7 % in an emergency setting. [15]

Hernia formation is multifactorial and has several conditions involving internal factors including age, gender, anatomic variations, and legacy and external factors such as smoking, co morbidity, and surgical factors.[16]

The subsequent are some of the vital recent developments in research of biology of hernia formation:

- Many recognized literature suggests that inguinal hernias represent an inherited disease; however, the inheritance pattern remains to be doubtful.[17]
- Type I to III collagen ratio is decreased in patients with hernias resulting in thinner and weaker collagen fibers [18]
- The connective tissue disorders found in patients with hernias are marked in direct and recurrent inguinal hernias as compared to patients with indirect inguinal hernias[19]

The modern era of genetics and biochemistry focuses on the exact cause and biology of hernia formation, and that can be used to detect the individuals at risk and prophylactic hernia repair surgeries.

PHYSIOLOGY

Mechanism of the inguinal canal [20]

The existence of the inguinal canal is a cause of fault in the lower part of the anterior abdominal wall. The weakness is strengthened by the subsequent factors.

1. Flap valve mechanism

The deep and superficial inguinal rings lie at opposite ends of the inguinal canal and the prevailing part of the canal is pressed flat when the aponeuroses are under tension and the intra-abdominal pressure rises.

2. Ball valve mechanism

Contraction of the cremaster muscles helps the spermatic cord to plug the superficial inguinal ring.

3. Slit valve mechanism

When external oblique muscles contract the intercrural fibers of the superficial ring appose causing a slit valve mechanism. This muscle has a triple relation to the inguinal canal. It forms the anterior wall, the roof, and the posterior wall of the canal. When it contracts the roof is approximated to the floor, like a shutter. The arching fibers of the transverses also take part in the shutter mechanism. The superficial inguinal ring is guarded from behind by the conjoint tendon and the reflected part of the inguinal ligament.

4. The deep ring is guarded from the front by the fleshy fibers of the internal oblique.

5. Hormones may play a role in maintaining the tone of the inguinal musculature.

Whenever there is a rise in intra-abdominal pressure (as in coughing, sneezing, and lifting heavy weights) all these mechanisms act into play so that the inguinal canal is obliterated, its openings are closed and herniation of abdominal viscera is prohibited and thus inguinal hernia is naturally prevented.

ETIOLOGY [21]

The occurrence of hernias depends on many factors. It is considered that 3 main factors lead to herniation of contents. The presence of preformed sac, repeated elevation in the intra-abdominal pressure, and weakening of the body muscles and tissue with time.

A. Congenital

The predisposing factor for indirect inguinal hernia formation is patent

processes vaginalis. But, it is not the only cause of hernia genesis as many people have patent processes but still doesn‘t have hernias. The descent of the testis carries along with it the processes, hence predisposes to hernia. Sex-wise males are more common sufferers of inguinal hernia.

Minor variants in the attachment and arrangements of the abdominal muscles also play a role in hernia genesis as direct hernias do not occur in females because of slenderness between the inguinal ligament and transverse arch.

People with congenital defects in tissue metabolism, relating to enzyme deficiency also suffer from a hernia. There are unbalanced collagen synthesis disorders such as Ehler‘s- Danlos Syndrome, where the tissues are defective.

B. Other Factors

1. Age: as age advances, abdominal muscle tissue becomes weak because of slow tissue breakdown; hence hernia is most common in elderly persons.

2. Fat: Increased fat layers in the different layers of the abdominal wall lead to weakness of that layer, hence leading to hernia formation.

3. Pulmonary Causes: Emphysema, chronic bronchitis, pneumonia causes tiring and difficult respiration which leads to a rise in intra-abdominal pressure.

4. Intra-abdominal Pressure: BPH, constipation, colonic carcinoma, all lead to straining to expel the excreta and urine, causing increased intra-abdominal pressure, hence leading to hernia formation

5. Heart and Liver conditions: Patients suffering from congestive heart failure and chronic liver disease have ascites, which opens up dormant patent processes leading to hernia formation.

6. Pregnancy: Stretching of the abdominal wall in pregnancy damages abdominal wall muscles which are later replaced by collagen tissue thus compromising the strength and preventing effective mechanism of these muscles thus predisposing to hernia formation.

C. Environmental Factors:

1. Vitamin Deficiency: Patients who are suffering from scurvy had a hernia and breaking up of healed scars, as vitamin C is essential for collagen synthesis and healing**.**

2. **Smoking:** Smokers develop an unwanted mixture of increase in proteolytic enzymes and reductions in alpha-antitrypsin enzyme, the major naturally occurring circulating protease. This amalgamation could lead to the fruition of a hernia by affecting the synthesis- degradation equilibrium of groin collagen and can lead to pathologic sequence initiated by disproportionate smoking.

D. Iatrogenic Factors:

Previous Surgeries:

1. Appendectomy may predispose to the development of an ipsilateral inguinal hernia. Due to damage of nerves which supplies abdominal wall muscles.

2. Increased intra-abdominal pressure linked with chronic ambulatory peritoneal dialysis often results in inguinal hernia formation

HISTORY OF HERNIA REPAIR

Hernia (Greek kele/hernios--bud or offshoot) has been a disease ever since mankind existed.[22] Hernias have been a theme of attention since the daybreak of surgical history. The management of groin hernia can be divided into numerous eras

Ancient Era (Ancient era to Fifteenth Century)

The Egyptian Papyrus of Ebers (circa 1552 BC) has literature on hernias: "when you judge a swelling on the surface of a belly, what comes out, caused by coughing".[22,23]

The mummy of Pharaoh Merneptah (nineteenth dynasty, 1224-1214 BC) illustrates a large lesion in the groin, with the scrotum separated from the body, from which Thorwald concluded that surgery had been performed on a scrotal hernia.[24]

Physicians in Alexandria used to treat inguinal hernias by tightly fitting bandages.[23,25]

Ancient Greeks (Hippocrates, 400BC) differentiated between hernia

and hydrocele". The former was reducible and the latter transilluminable[25], and suggested Taxis for strangulation[23]

Aulus Cornelius Celsus in the earlier part of the first century AD described the operation in vogue at that time in the fresco-roman areas. Through an incision in the neck of the scrotum, the hernia sac was dissected off the spermatic cord and transacted at the external inguinal ring. The testis usually was excised as well.

In 200 AD, Galen thought that herniation was produced by the break of the peritoneum with stretching of overlying fascia and muscles.[23]

Paul of Aegina, in 700 AD differentiated between in-complete inguinal hernia (bubonocele) and complete inguinal hernia (scrotal).

Then in 1363, Guy de Chauliac Chirurgia Magna, for the first time differentiated between femoral and inguinal hernia and also described the technique of reduction of strangulation by Taxis.

The era of the Start of Herniology (Fifteenth to Seventeenth Centuries)

During the great Renaissance, New surgical knowledge was born and laid the foundation of Herniology.

Ambroise Pare, in his literature, The Apologie and Treatise dedicated an entire chapter to hernias[26], it described the hernia operation in detail and gave an account of how the hernia contents should be reduced into the abdominal cavity and the peritoneum should be sewn up. When the "rupture" cannot be treated "by reason of the great solution of the continuity of the relaxant, or Peritoneum," Pare advocated the use of the golden ligature, or the punctusaureus, the golden thread or golden tie. He opposed the radical herniotomists who produced castration[27]

Practica Copiosa by Kaspar Stromayr in 1559, for the first time, explained the difference between indirect and direct inguinal hernias. He justified removing the testis in indirect hernias but not in other forms.

Anatomic Era (Seventeenth te Nineteenth Centuries)

After the resurgence, as autopsy and anatomic categorization traverse

throughout Europe, information about groin hernia piled up rapidly.

In 1757, Sir Percival Pott described the pathophysiology of strangulation and suggested surgical management, and in 1785 Richter reported on partial enterocele.[28,29]

In 1790, John Hunter noticed continuity of processus vaginalis and tunica vaginalis, hence suggesting the congenital nature of a few indirect hernias[30]

In 1814, Scarpa described hernia en glissade (sliding). [31]

In 1804 Cooper described the fascia transversalis and separated it from the peritoneum and verified that it was the main barrier to herniation.[32,33,34]

In 1814 Hesselbach reported his triangle and the iliopubic tract.[35]

The anatomic era recognized the basic knowledge for future growth. Sepsis, however, remained the main barrier to hernia surgery.

The era of Hernia Repair under Tension (Nineteenth to mid-twentieth Century)

The fundamental principles of modern hernia surgery were recognized during this era.

Marcy, an American surgeon and a pupil of Joseph Lister, was the first to introduce antiseptic techniques in the repair of hernia and is also known for establishing three of

the principles of hernia surgery:

(i) Antisepsis in hernia surgery

(ii) High ligation of the sac

(iii) Narrowing of the internal ring.

Unluckily, these procedures failed to attain the goal of a thorough cure of inguinal hernia.

The greatest contribution to hernia surgery was that of Italian surgeon, Eduardo Bassini. As his epoch-making reports transformed the way hernias were managed[36-40]

He realized the importance of obliterating the canal with deep suturing of the rings, he reconstructed the canal physiologically by repairing the transversalis fascia and reinforcing the posterior wall of the canal.

Using interrupted sutures of silk, he sutured the internal oblique and the transverses abdominalis muscles as well as the upper leaf of the fascia transversalis in one layer to the lower leaf of the transversalis fascia and the inguinal ligament. Bassini first performed this operation in 1884 and was first to present such a large series with careful follow-up. During the next 100 years, most inguinal hernias were repaired by the bassini method or variation of it.

At around the same time, Williams S. Halsted described a separate procedure for the treatment of inguinal hernia.[41] The major dissimilarity between the Bassini procedure and this operation (commonly referred to as the Halsted I procedure) was the transposition of the cord to a position over the external oblique aponeurosis

In 1956 Fruchaud introduced the notion of the myopectineal orifice and fascia transversalis tunnel for all groin hernias[42]

The era of Tension-free Hernia repair (Mid-Twentieth Century to present)

The Bassini repair rapidly led to the understanding that tension on the pubic end resulted in pain and could lead to reoccurrence at that site, particularly with the atrophied conjoint tendon.

Wolfler planned the anterior relaxing incision in the rectus sheath to conquer this problem.[43] Berger made a slit in the anterior rectus sheath, sutured the lateral flap down to Poupart's ligament[44],

In 1903, Halsted neglected cords skeletonization to avoid hydrocele and testicular atrophy and adopted Andrews' imbrications and the Wolfler-Berger practice of a relaxing incision and a rectus sheath flap (Halsted II operation)[45]

To overcome these problems, operators have sought the ideal tension-less or tension-free repair. There has already been general agreement that the first step, after dealing with the sac, is to repair the weakened or torn posterior wall of the inguinal canal, the transversalis fascia, and to tighten the stretched internal ring around the cord. This means doing a Marcy-Type of repair.

Introduction of Mesh in Hernia Surgery

Marcy was the first surgeon to use an animal sinew, recommend kangaroo tendon in 1887[46],

In 1901, Mc Arthur reported using pedicled strips of the external oblique aponeurosis woven between the conjoint tendon and inguinal ligament.

In 1948, Moloney introduced the forerunner of modern Nylon darn techniques with a recurrence rate of less than 1%. This is the tensionless technique in which after dealing with the sac, the posterior wall of the canal is repaired by approximating the rectus sheath and the conjoint tendon to the inguinal ligament with a continuous monofilament nylon suture.

While the darners were darning, the patchers were seeking the ideal patch in the form of a sheet of natural tissues, biological materials, metals, or synthetic sheets or weave to fill in the gap in the weakened posterior wall of the canal.

Later on, surgeons sought sheets of natural tissues as a free graft from the thigh, fascia lata, or abdominal was and even sheets of skin, as reported by Mair in 1945 to be sutured to the edges of the posterior wall of the inguinal canal.

These methods proved uniformly disappointing with no real progress was made until the development of modern synthetic polymer plastics in the form of sheets of woven or knitted mesh of polyamide and the newer polypropylene.

Polypropylene mesh was primarily introduced and popularized by Usher in a series of trials and early clinical papers reported from 1959 to 1963[47,48] the results of this mesh were so fine that it has become the most admired prosthesis obtainable for surgical implantation. The availability of synthetic prosthetic materials for hernia repair with good results paved the way to tensionless hernia repair and outdated the use of tension-relaxing incisions.

In February 1989 Lichtenstein et al, reported on 1000 successive patients with primary repair of inguinal hernia using a "tension-free"

repair using a Marlex mesh prosthesis to bridge the direct floor of the canal without approximating the tissue defect[49], Thus the fifth principle of hernia repair, tensionless repair, was at last consolidated by Lichtenstein. The Lichtenstein repair became popular soon after its beginning.

Stoppa and colleagues first described their use of a large, unsutured Dacron prosthesis in the repair of difficult groin hernias through the preperitoneal approach by the use of a low midline incision in 1975[50].

The concept of the preperitoneal approach, according to Nyhus[51,52], actually was first described by Thomas Annandale of Edinburgh in 1876. Read and McVay were among those who have reported on this approach, but it was Nyhus and associates who recognized it steadily as a steady technique based on detailed anatomic and clinical studies[53,54]

In 1982, Ger et al. first reported the laparoscopic repair, using a michel staple applied with a Kocher clamp to close the peritoneal breach of a hernia sac under laparoscopic guidance.[55]

Bogojavlensky treated inguinal and femoral as laparoscopically through a preperitoneal patch[56]

Schultz et al. in 1990 reported a series of 20 patients, treated with the laparoscopic approach in which the peritoneum was opened and a plug of polypropylene mesh inserted in the internal ring.[57]

Filipi et al. and Redmond and acquaintances reported 50 patients who underwent transabdominal intraperitoneal Onlay polypropylene mesh repair, out of which, three patients with direct hernia experienced recurrence, and four others developed widespread adhesions the mesh[58],

In 1992 Fitzgibbons performed a sequence of intraperitoneal Onlay mesh repairs in which polypropylene mesh was protected to the abdominal wall with staples[59]

Canadian surgeon E.E. Shouldice contributed substantially to hernia surgery in the second half of the 20th century. He founded a clinic in Canada, that has become a center devoted exclusively to the treatment

of abdominal wall hernias. The Shouldice procedure of inguinal hernia repair revitalizes Bassini's original technique[60] It applies the principle of an imbricated posterior wall closure with continuous monofilament stainless suture.

Laparoscopic Hernia Repair

Ralph Ger in New York in 1982, viewing the deep inguinal ring in 15 dogs through a peritoneoscope, used Kocher clamps to apply Michele staple clips to the neck of the peritoneal sac.[61] Ger‘s work was interesting but it did not create much clinical interest.

In June 1988, McKernin and Saye in Marietta, GA, and Reddick and Olson in Nashville, TN, successfully removed gallbladders laparoscopically in humans.[62] Though surgeons in Europe, including Muhe (1987) in Germany, Mouret (1988), and Dubois (1988) in France, had done laparoscopic cholecystectomy, none of them inspired the amount of interest in this new move, as did these American surgeons. It was their work that proved revolutionary and opened the world’s surgical community and its encouraging industries to further discover and to educate the several possibilities of laparoscopic surgery.

Three basic approaches to laparoscopic groin hernia have evolved:

1. The Intra-peritoneal Onlay Mesh (IPOM)
2. The Trans-Abdominal Pre-Peritoneal Inguinal Hernia Repair (TAPP)
3. Totally Extra-Peritoneal Inguinal Hernia Repair (TEP).
4. enhanced view- Totally Extra-Peritoneal Hernia Repair(e-TEP)

Robotic techniques are being explored for hernia repair.

INTRA-PERITONEAL ONLAY MESH REPAIR (IPOM)

Advocated by Fitzgibbons and colleagues and Franklin and later on abandoned by Fitzgibbons because of complications related to possible mesh erosion into the bowel.

TRANS-ABDOMINAL PRE-PERITONEAL REPAIR (TAPP)

This is the form of laparoscopic inguinal hernia repair in which, after creating pneumoperitoneum, a horizontal incision is made in the peritoneum over the cephalad aspect of the hernia, followed by

dissection in the pre-peritoneal space, the hernia sac is identified, the sac is then reduced or incised depending upon size and peritoneum approximated, a pre-peritoneal mesh prosthesis is placed. Bilateral hernias can be repaired using a single long transverse peritoneal incision extending from one anterior superior iliac spine to the other and placing a single large mesh in the pre-peritoneal space.

TOTALLY EXTRAPERITONEAL HERNIA REPAIR (TEP)

Totally extraperitoneal hernia repair (TEP) is a new technique of repairing inguinal hernias where the dissection and repair are carried out without entering/opening the peritoneal cavity. McKernan and Law first introduced totally extraperitoneal hernia repair in 1993 [63]

Bilateral inguinal hernias and recurrent hernias after open repair are two well-accepted indications for TEP. In patients with bilateral hernias, both sides can be dissected, inspected, and fixed using the same ports, thus the morbidity related to port insertion and wound complication remains small. [64-66]

Repair of recurrent hernias is tougher, depending on the approach used in the past. Scarring and the presence of mesh or a mesh plug can demolish the anatomical planes and increase the chances of damaging the peritoneum or other structures. Patients who have had prior repairs that did not invade the pre-peritoneal space, like Lichtenstein repair, are the paramount candidates for TEP repair.

In skilled hands, there is no absolute contra-indication to totally extraperitoneal hernia repair; however, a watchful decision should be made to adapt the approach to both patient and surgeon aspects [67,68]

Although classical TEP technique is the laparoscopic technique of hernia repair which is considered closest to ideal for inguinal hernia repair, though this technique has several drawbacks such as-

1. Limited space for dissection and mesh placement
2. Restricted port placement
3. Low tolerance of accidental pneumoperitoneum
4. Difficulty in teaching and learning the technique.

Enhanced-view TOTALLY EXTRA-PERITONEAL APPROACH (eTEP)[69]

The eTEP technique is the extended view modification of the classical TEP which was described by Jorge Daes and is based on the principle that the pre-peritoneal space can be reached from anywhere in the anterior abdominal wall. This technique overcomes several of the drawbacks of the classical TEP approach as described above

The eTEP approach provides several advantages over TEP, mainly

1. Extraperitoneal space can be created quickly and easily
2. Provides a large surgical field for dissection and mesh placement
3. Provide a flexible port setup suitable for different situations
4. Allow unhampered and easy parietalization of the cord
5. Ease the management of the distal sac in cases of large inguinoscrotal hernias
6. Improve tolerance of accidental pneumoperitoneum (common complication)

eTEP is mainly helpful in,-

1. Obese or post-bariatric patients: eTEP allows the surgeon to avoid the difficulties caused by excessive fat; in addition, the subcutaneous tissue is thinner higher in the abdomen.

2. In short-statured people, with short umbilicus and pubic symphysis distance.

3. Patients with a history of previous pelvic surgeries.

4. Recurrent Inguinal Hernias, previously repaired by an open technique (with/without prosthesis)

With experience, surgeons can expand the use of this approach for inguinal hernia repair to cases of large inguinoscrotal, sliding, or incarcerated hernias. This may require a combination with a 5 mm laparoscopic intraperitoneal approach to verify the viability of the intestine or assist in reducing the incarcerated content

LAPAROSCOPIC VIEW OF SURGICAL ANATOMY OF THE GROIN[70]

ANATOMIC STRUCTURES OF THE PREPERITONEAL SPACE: VIEW AFTER CREATION OF TOTALLY EXTRAPERITONEAL DISSECTION PLANE

TRANSVERSALIS FASCIA AND PREPERITONEAL SPACE

The preperitoneal space lies between the peritoneum internally and the transversalis fascia externally. Within the preperitoneal space, there is a variable quantity of adipose tissue, loose areolar connective tissue, and membranous tissue. The transversalis fascia is perhaps the most important fascial structure in the groin as it is involved in both the development of a hernia as well as its treatment. Both structures appear strong and difficult to break through especially in the young patient with an indirect hernia. The deep membranous layer (extraperitoneal fascia) divides the preperitoneal space into a visceral and a parietal compartment. The parietal compartment contains the epigastric vessels and numerous small tributaries and may be associated with troublesome bleeding during dissection. The genitofemoral and lateral femoral cutaneous nerves also travel within this compartment, but when preserving the deep layer, these important structures are not touched neither when dissecting nor when implanting the mesh. The visceral compartment is avascular and dissection should proceed in this plane. Therefore, the visceral compartment is the right place for the accommodation of the mesh.

Medially, both laminae of the transversalis fascia insert inferiorly on the ligament of Cooper. Laterally, its course is less clear. Around the internal inguinal ring, the deep fibers may envelop the cord structures and contribute at least partially to the spermatic sheath. The morphology of the spermatic sheath is triangular with an anterior apex at the deep aspect of the inner inguinal orifice and a posterior medial base. The vas deferens make up its medial border while the spermatic vessels delineate the lateral border. The base of the sheath disappears beneath the retracted peritoneal sac when parietalization is performed. In addition, the spermatic sheath covers the external iliac vessels which reside just deep into the triangle. Although the origin of this

sheath is not clearly defined as either a prolongation of the urogenital fascia or a continuation of the deep layer of transversalis fascia – for the surgeon it is of essential importance to recognize this sheath and not to violate it when dissecting the pelvic floor, except at the level of the internal inguinal ring anteriorly

With an indirect hernia, the sheath is opened at the ring to identify and reduce the hernia sac as well as when parietalizing the cord structures

The surgeon must preserve this important fascial layer for two reasons:

(1) To avoid an injury to the vessels or the nerves during dissection

(2) To avoid direct contact between the nerves and mesh which may produce pain in the later postoperative period due to perineural scarring.

For the same reason, implantation of a slitted mesh cannot be recommended as the integrity of the fascia will be destroyed and the nerves, spermatic vessels, and vas are all placed at risk

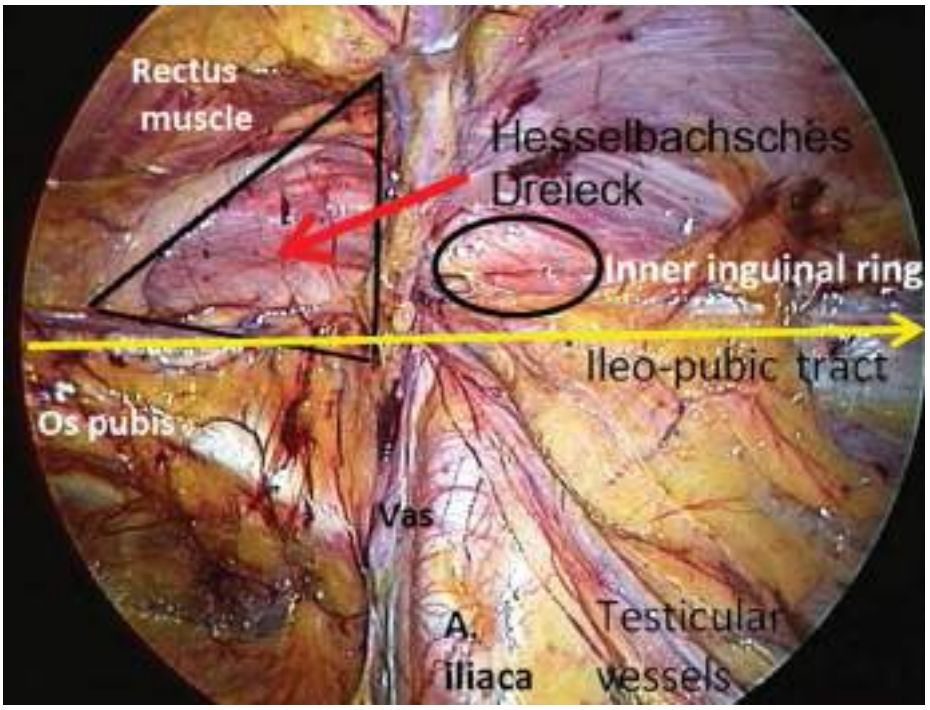

Figure 4: Anatomy of the right groin after dissection of the peritoneal flap and exposing all important landmarks

PREPERITONEAL SPACE AND THE VESSELS

The location and the course of the vessels remain fairly constant with a few common variations and identification is typically straightforward.

The inferior epigastric vessels are perhaps the most important

landmark in the myopectineal orifice and are easily recognized even in obese patients. It is important to recognize that in case a large hernia sac or a lipoma is present, the vessels may be dislocated medially. The epigastric vessels originate from the external iliac vessels and may be surrounded by fatty tissue as well as lymph nodes. This tissue must be respected and not removed when dissecting the groin.

The same consideration applies to the iliac vessels which are protected by the spermatic sheath. The iliac artery, located at the bottom of the pelvis and in the middle of the preperitoneal space, may be identified by following the epigastric downward toward their origin. The iliac vessels may be accompanied by fatty tissue and lymph nodes and over-dissection may lead to bleeding, potential nerve injury, or lymphatic leakage. Preservation of the spermatic sheath will avoid these issues. The iliac vein is located posterior and slightly medial to the artery. It may be visualized during dissection of the groove in the triangle between the lower branch of the pubic bone, the iliac vessels, and the wall of the urinary bladder. Dissection of this region should be performed with special caution looking for the presence of a Corona Mortis, a vascular connection between the epigastric and obturator vessels. This variant, found in 20-30% of patients, is important because intraoperative bleeding can be difficult to control due to the dual vascular supply from the obturator and iliac vessels (Corona Mortis).

Moreover, in this region, there may be several variants of anastomosing vascular branches between the pubic artery/vein and the epigastric and obturator vessels. These small vascular tributaries may form a network investing the pubic bone, Cooper’s ligament, and the direct and femoral spaces. These vessels and the underlying pubic bone are covered by a very thin membrane (deep layer of the transversalis fascia) which should not be disrupted. The correct plane of dissection will preserve this membranous layer and blunt dissection may be used to push away the urinary bladder developing the retropubic space for mesh placement.

When dissecting downward to the urogenital space, special care

should be paid to the umbilical artery originating from the internal iliac artery. Attention, the vas, traverses directly over the artery. Furthermore, the surgeon should be aware that the umbilical artery may be patent and, in the case of injury, bleeding may be profuse and difficult to control. The testicular vessels are easily identifiable but can be most clearly defined at their caudal aspect between the external iliac vessels and the psoas muscle and course from caudal-lateral to cranial-medial. The testicular vessels meet the vas deferens at the apex of the triangle immediately at the entrance to the internal ring. The vas deferens travels downward crossing the iliac vessels medially, following the “preperitoneal loop” but then changes its direction like a knee and dives down to urogenital space to join the prostate gland. To complete the parietalization, it is important to cut this “preperitoneal loop”

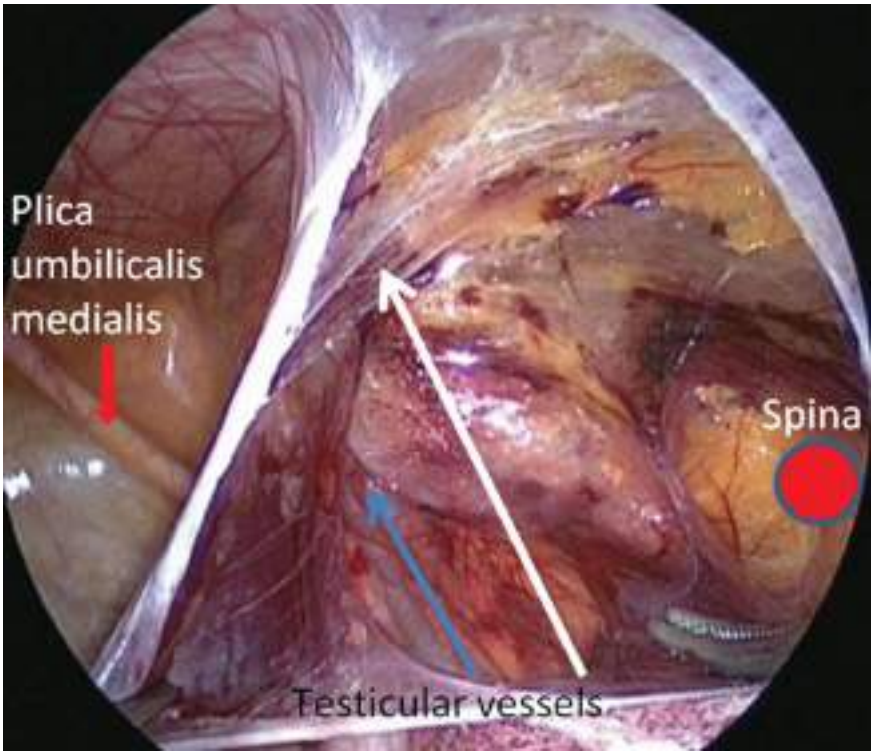

Figure 5: Entering the preperitoneal space from lateral just in front of the deep layer of the transversalis fascia

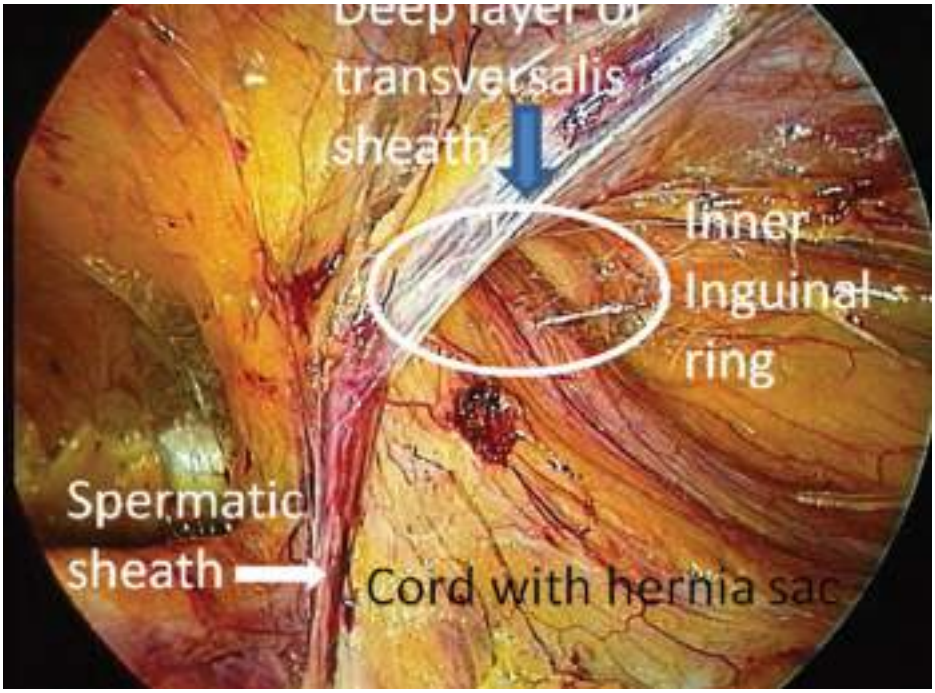

Figure 6: Continuation of the deep layer of the transversalis fascia into the spermatic sheath

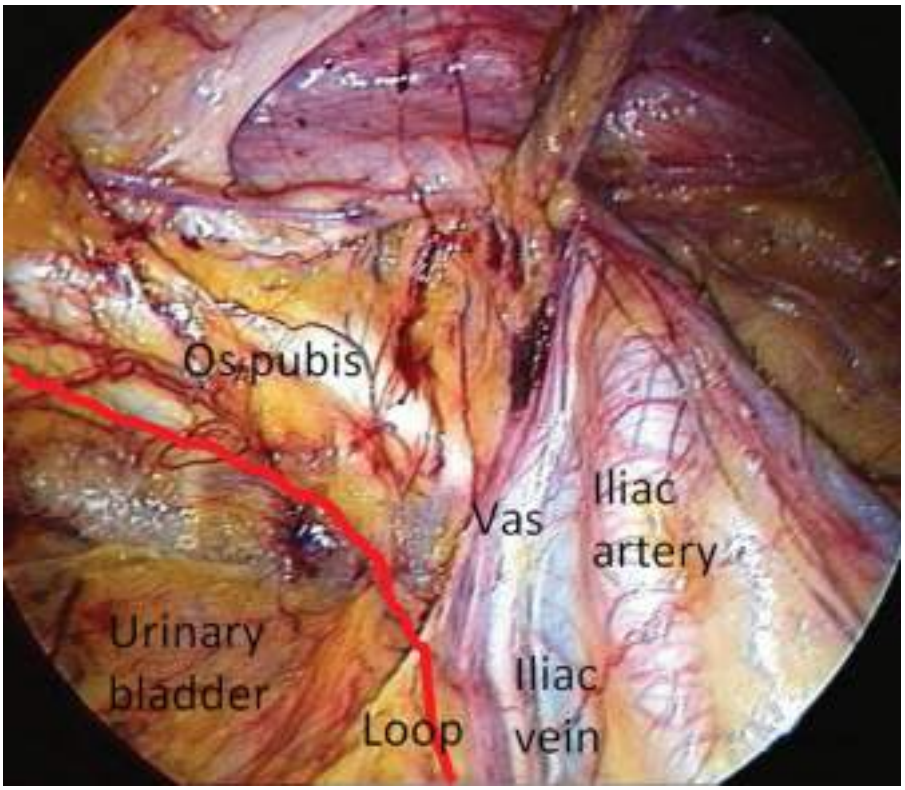

Figure 7: EXPOSITION OF THE ILIAC VESSELS AND THE "GROOVE"

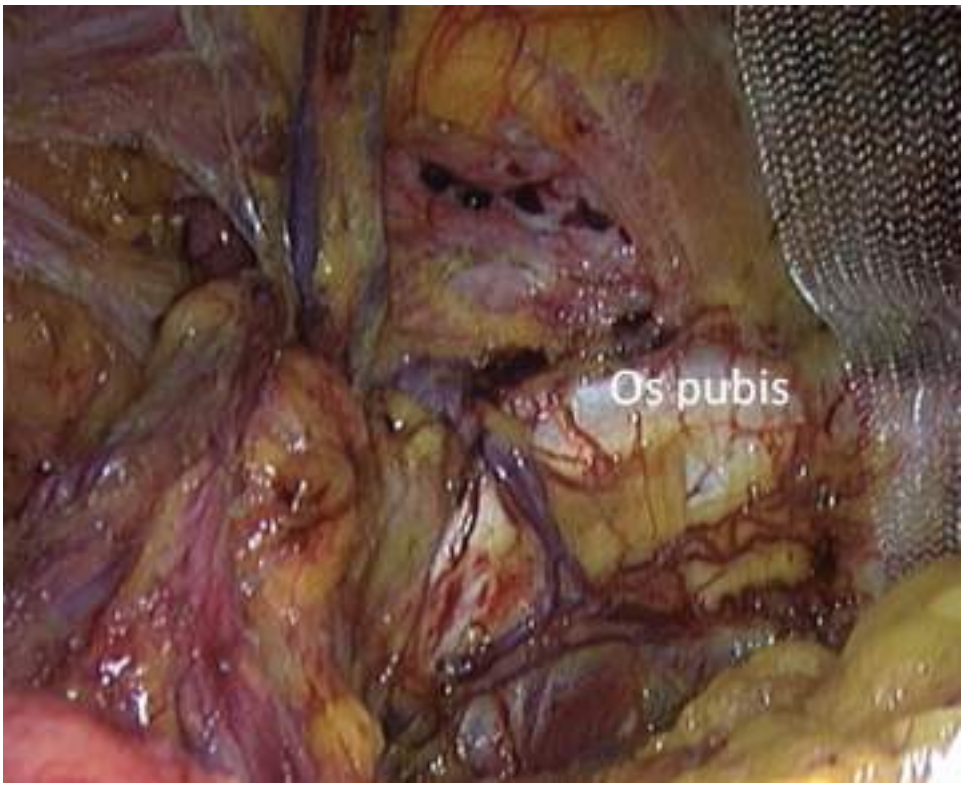

FIGURE 8: VESSELS AROUND THE PUBIC BONE

PREPERITONEAL SPACE AND TOPOGRAPHIC ANATOMY OF THE NERVES

In total, six nerves are of interest in laparoscopic inguinal hernia repair and this neuroanatomy should be well understood by all surgeons.

Anatomically, the nervus hypogastricus and the nervus ilioinguinalis are not involved in the dissection and repair planes utilized by laparoscopic hernia repair. These nerves have typically exited the retroperitoneum and entered into the anterior abdominal wall and inguinal canal lateral and superior to the anterior superior iliac spine. But In about 32% of cases, the course of the Ilioinguinal nerve may be within the operating field and may be at risk during the placement of staples in the neighborhood of the anterior superior iliac spine.

The femoral nerve, which arises from the dorsal branches of the ventral rami of the second, third, and fourth lumbar nerves, is located just lateral to the iliac vessels and lateral and beneath the testicular vessels. This is usually well protected by the psoas tendon, surrounding fatty and lymphatic tissue, and spermatic sheath or iliac

fascia. Therefore, injury to this nerve is extremely rare during laparoscopic hernia repair. Reported injury to the obturator nerve is rare and anecdotal as it shares the same origin as the femoral nerve and is well hidden deep in the triangle between the pubic bone and the iliac vessels behind the vessels.

The more common nerve injuries seen with laparoscopic inguinal repairs are lesions of the genitofemoral nerve and lateral femoral cutaneous nerve. Each of these complications should be taken seriously as they can have disastrous consequences for the patient. Intractable pain may arise when nerves are injured, clipped, tacked, or scarred to mesh.

While the course of the obturator and femoral motor nerves is largely predictable and constant, the course of the sensory nerves (genitofemoral and lateral femoral cutaneous) demonstrates great variability. Most at risk during laparoscopic hernia repair are the lateral femoral cutaneous nerve (58.2% of all nerve lesions) and the femoral branch of the genitofemoral nerve (31.2% of all nerve lesions). Injury to the genital branch of the genitofemoral nerve comprises 4.7% of all published nerve lesions.

The lateral femoral cutaneous nerve arises from the dorsal divisions of the second and third lumbar nerves. It emerges from the lateral border of the mid-psoas muscle and crosses the iliacus muscle obliquely traveling toward the anterior superior iliac spine. It then passes under the inguinal ligament, through the lacuna musculorum, and then over the Sartorius muscle into the thigh, where it divides into an anterior and a posterior branch. The anterior branch becomes superficial about 10 cm below the inguinal ligament and divides into branches that are distributed to the skin of the anterior and lateral parts of the thigh reaching as far as the knee. The posterior branch supplies the skin from the level of the greater trochanter to the middle of the thigh.

Intraoperatively, the surgeon should be aware that the lateral femoral cutaneous nerve will typically cross the middle of the operating field, but the majority (57%) demonstrates variability from the normal course.

Single (44%), double (23%), or multiple nerve trunks may be identified. The point of exit where the nerve penetrates the abdominal wall is typically lateral to the field 2 to 4 cm medial to the anterior superior iliac spine at the level of the iliopubic tract. However, this exit point also demonstrates significant variability and may be found up to 6 cm medially (only 3 cm lateral to the inner inguinal ring) and in 7% of the cases may even exit lateral and cranial to the anterior superior iliac spine.

The genitofemoral nerve arises from the upper L1–L2 segments of the lumbar plexus. It passes downward and emerges from the anterior surface of the psoas major muscle. The nerve continues on the surface of the psoas muscle progressing caudally toward the inguinal canal and divides into two branches, the genital branch, and the femoral branch. In men, the genital branch continues down and supplies the scrotal skin. In women, it accompanies the round ligament and supplies the mons pubis and the labia majora.

Wide variation in the course of this nerve is seen. In contrast to classically described anatomy, the genital branch runs through the inguinal canal in only 14% of cases. In 44% of cases, it consists of 2–5 branches, in 49% of the cases, the nerve perforates the abdominal wall 1–3 cm lateral to deep inguinal ring just through the iliopubic tract, and in 5% through the lacuna vasorum. The femoral branch passes underneath the inguinal ligament (iliopubic tract) traveling adjacent to the external iliac artery, supplying the skin of the upper, anterior thigh. In 58% of the cases, 2–5 branches are found, and in 73%, the branches perforate the abdominal wall 2–5 cm lateral to the deep inguinal ring. There is a wide variation in the exit site with perforation of the nerve below (30%), above (16%), or through (54%) the iliopubic tract. In rare cases, the nerve may run near the anterior superior iliac spine or through the inguinal canal.

The wide variation of the number and course of sensory nerves that traverse the preperitoneal space creates significant potential for overlap with the genital branch, femoral branch, lateral femoral

cutaneous, and even Ilioinguinal nerve and a wide area in which injury can occur. Respecting this proper dissection planes and knowledge of this neuroanatomy will minimize contact and risk.

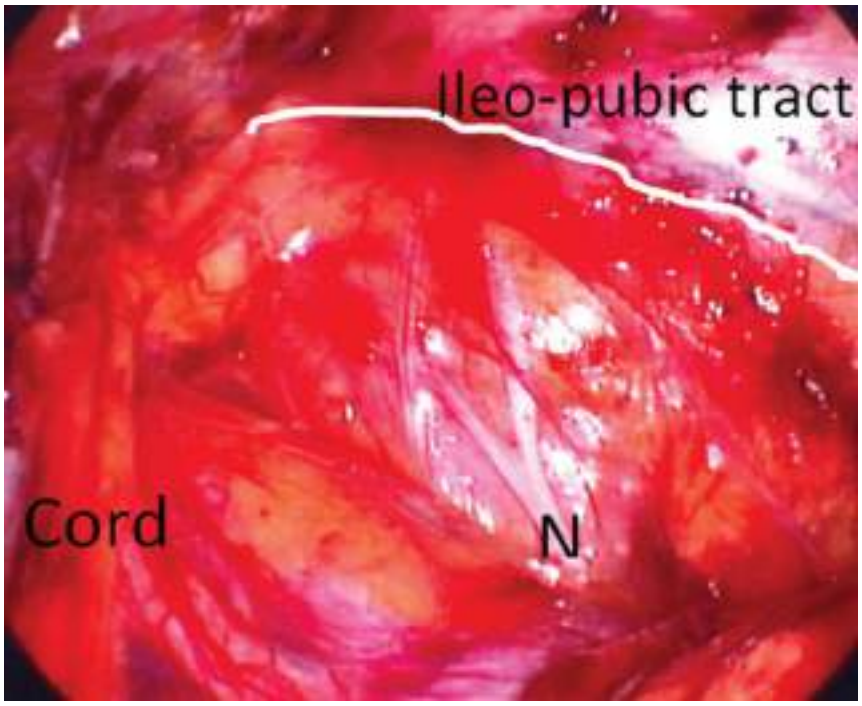

Figure 9: NERVUS GENITOFEMORALIS

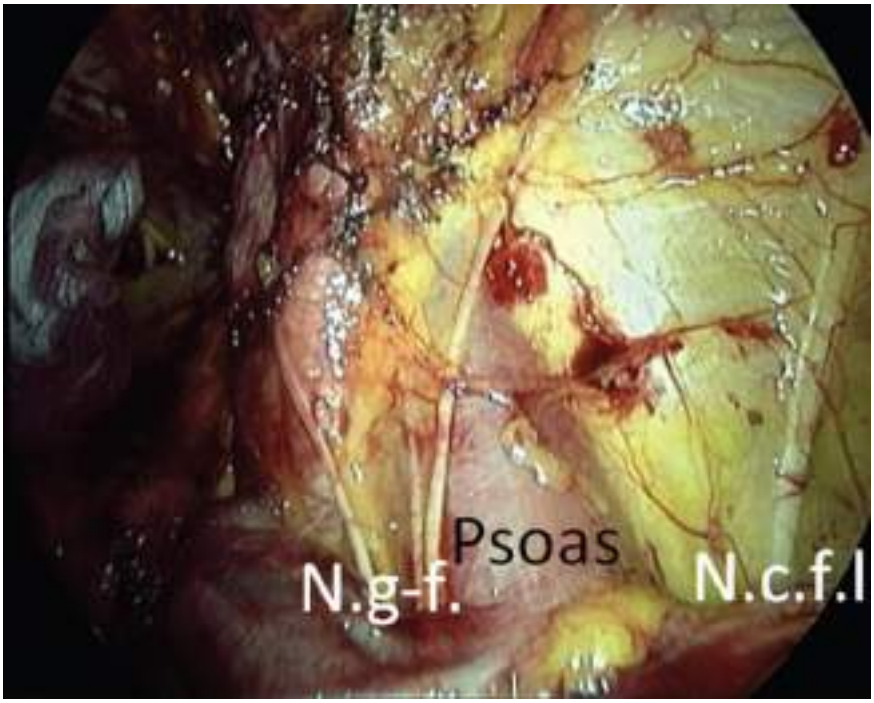

FIGURE 10: VARIATION OF NERVUS GENITOFEMORALIS (N. G-F.; BRANCHES) AND NERVUS CUTANEOUS FEMORIS LATERALIS (N.C.F.L.)

THE ILIOPUBIC TRACT AND THE MUSCULAR/VASCULAR LACUNA

The iliopubic tract is one of the most important landmarks of the groin. Whereas the inferior epigastric vessels divide the groin into a medial and a lateral compartment, the iliopubic tract divides the groin into an upper and lower part. The operation should always commence with identification of the iliopubic tract cross-checking the anatomy with palpable surface features – an essential step of the operation. Careful dissection is imperative below the tract because of the important structures – vessels, cord, and nerves – that reside in this field (trapezoid of disasters). Above this line, typically only the epigastric vessels pose any risk. However, as noted in the prior neuroanatomy section, some aberrant branches of the genitofemoral and lateral femoral cutaneous nerve can perforate the abdominal wall up to 1–2 cm above the tract.

The iliopubic tract corresponds to the anteriorly identified inguinal ligament and is loosely connected with it when visualized from outside. The iliopubic tract is a thickened band of transversalis fascia fibers that curve over the external iliac vessels attached laterally to the iliac crest, arching across the front of the femoral sheath, and inserting as a broad attachment into the pubic tubercle and pectineal line.

Furthermore, the tract is attached to the iliopectineal arch which forms a septum that subdivides the space deep to the inguinal ligament into a lateral muscular lacuna and a medial vascular lacuna, the latter hosting the iliac vessels and the femoral nerve. The iliopubic tract lies beneath the deep inguinal ring, forming the entire aponeurotic order of that aperture. It is the iliopubic tract, not the lacunar ligament as usually described, that defines the medial border and roof of a normal femoral canal from the laparoscopic viewpoint, the place a femoral hernia may develop.

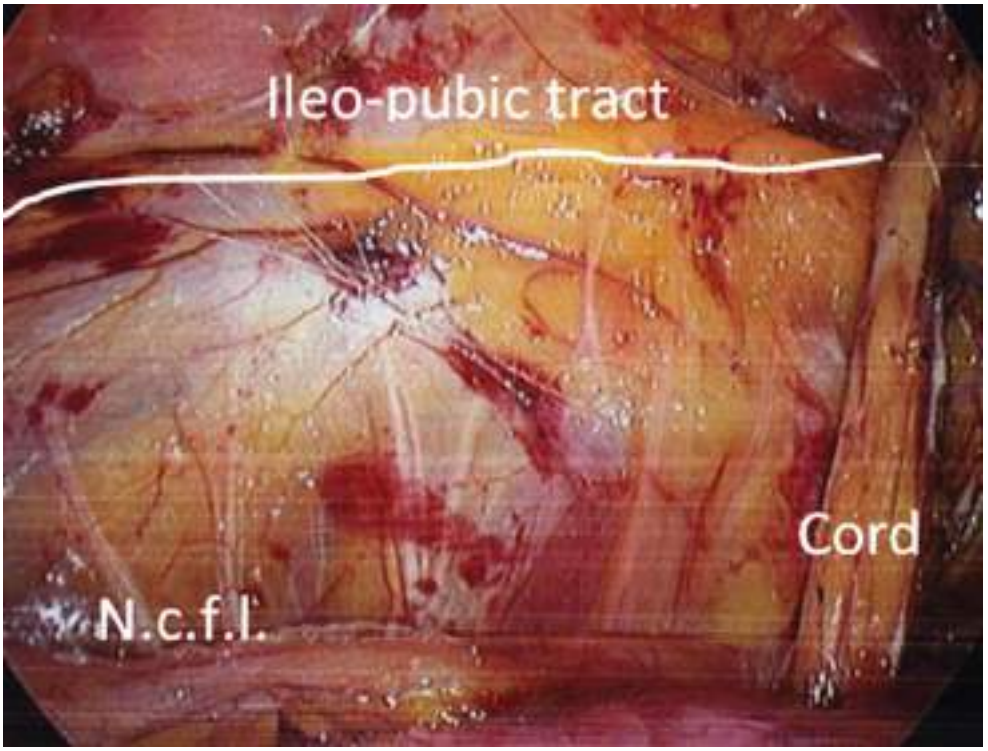

FIGURE 11: VARIATION OF NERVUS CUTANEOUS FEMORIS LATERALIS (N.C.F.L.; 2 BRANCHES)

SURGICAL TECHNIQUE[71]

All the procedures are performed under general anesthesia, in a supine position with a Foley catheter placed in the urinary bladder

Step 1

• Principle: High camera port placement compared to the original totally extraperitoneal port position to allow wider access to the lower pre-peritoneal space.

• A 10-mm skin incision is made 5 cm lateral and cranial to the umbilicus (on the ipsilateral side of hernia/larger hernia in case of B/L hernias). Optical entry using a 10-mm 0-degree telescope with low-flow insufflation, or direct cut-down, and entering into pre-peritoneal space. With gas insufflation set to pressure 15 mm Hg and high flow, change telescope to 30-degree and gently dissect the pre-peritoneal plane with the tip of the telescope in the caudal and medial directions around the umbilicus. A 5-mm working port is inserted infra-umbilically. A second port (5 mm) is inserted into the contralateral lower quadrant. In bilateral hernias, this port can be positioned below the first port in the midline.

FIGURE 12: VISIPORT ENTRY INTO PRE-PERITONEAL SPACE.

Step 2

• Principle: Development of wide extra-peritoneal space allowing critical view of myopectineal orifice.

• Using the combination of blunt dissection and monopolar cautery, a Fenestrated and Maryland grasper is used to develop the space of Retzius, identifying the pubic bone and Cooper's ligament. The space of Bogros is then developed by dissecting the transversalis fascia off the peritoneum.

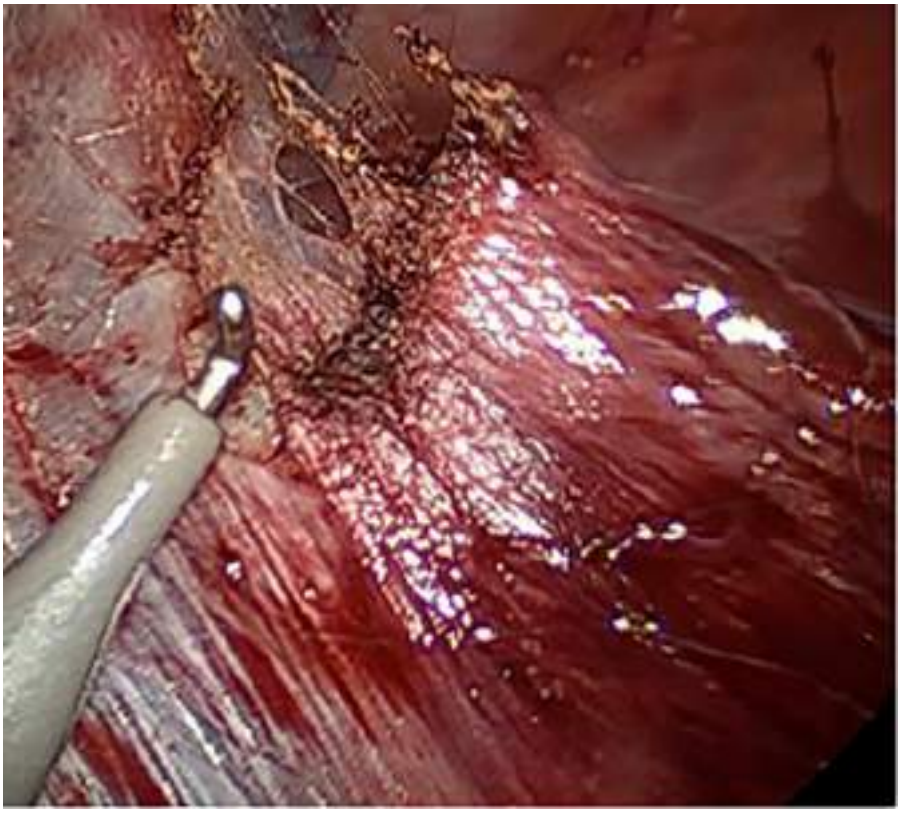

FIGURE 13: DIVISION OF ARCUATE LIGAMENT FOR WIDE LATERAL SPACE

Step 3

• Principle: Wide lateral dissection.

• Telescope is moved to the umbilical port. Generous lateral dissection of space of Bogros with a combination of blunt counter traction and sharp hook diathermy division. The arcuate ligament is carefully divided with a hook. Be careful not to breach the peritoneum. Repair with 3.0 V-Loc suture if peritoneum is breached, to maintain pneumo in pre-peritoneal space.

Step 4

• Principle: Ensure the hernia sac and its contents and cord lipoma is reduced completely.

• Once the pre-peritoneal space is fully developed, the patient is assessed for the presence of direct or indirect inguinal/femoral/obturator hernia. Ensure all hernias and their content is reduced with counter traction with cord elements parietalized. If a chronic sac is encountered, too much counter traction may increase

the risk of de-vascularizing the spermatic cord. In this situation, transect the sac as distal as possible and stitch this closed with V-Loc. Cord lipoma needs to be reduced before mesh placement.

Step 5

• Principle: Wider mesh to ensure adequate coverage of myopectineal orifice.

• A wider space allows the mesh to be deployed on the anterior abdominal wall and then unfolded carefully. Modern Mesh has the advantage of not requiring any fixation. In the setting of a large direct inguinal hernia, the mesh can be secured to Cooper's ligament with a suture or tack

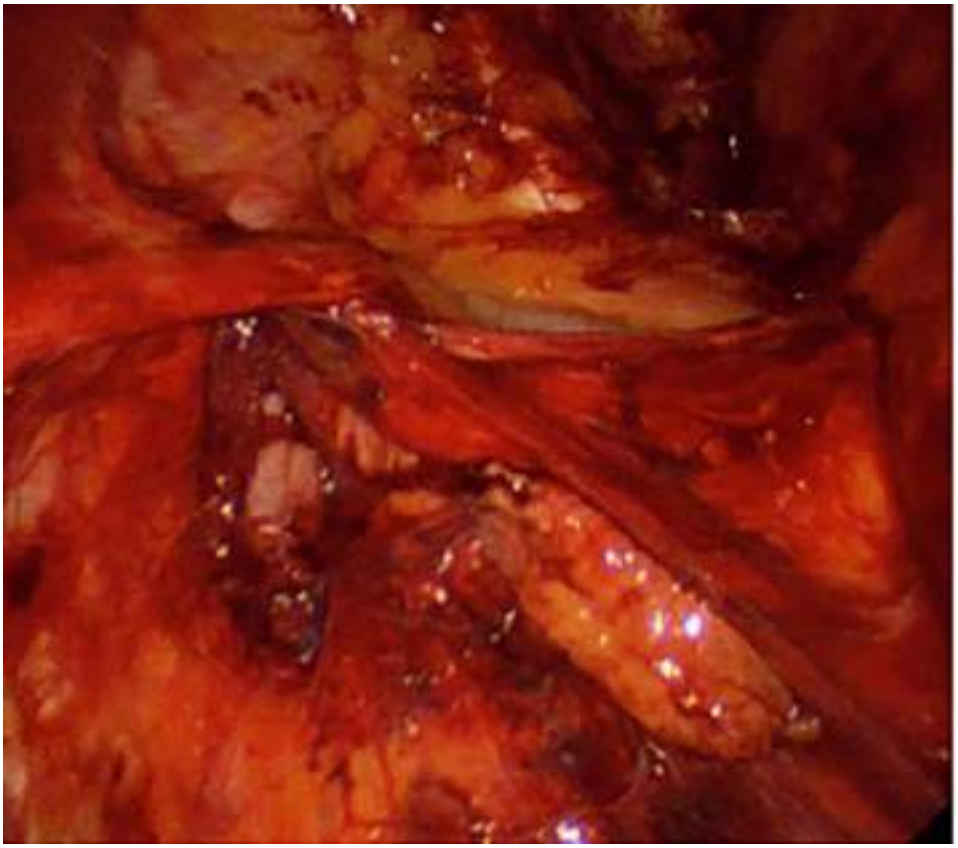

FIGURE 14: POST-REDUCTION OF HERNIA, WIDE VIEW OF MYOPECTINEAL ORIFICE

Step 6

• Principle: Ensure good hemostasis and recheck mesh position before closure.

• Ilioinguinal block under vision. Check for hemostasis. With the Maryland grasper maintaining the mesh in place, the pre-peritoneal space is desufflated. Once done, pneumo is re-established to check that the mesh is in the optimal position.

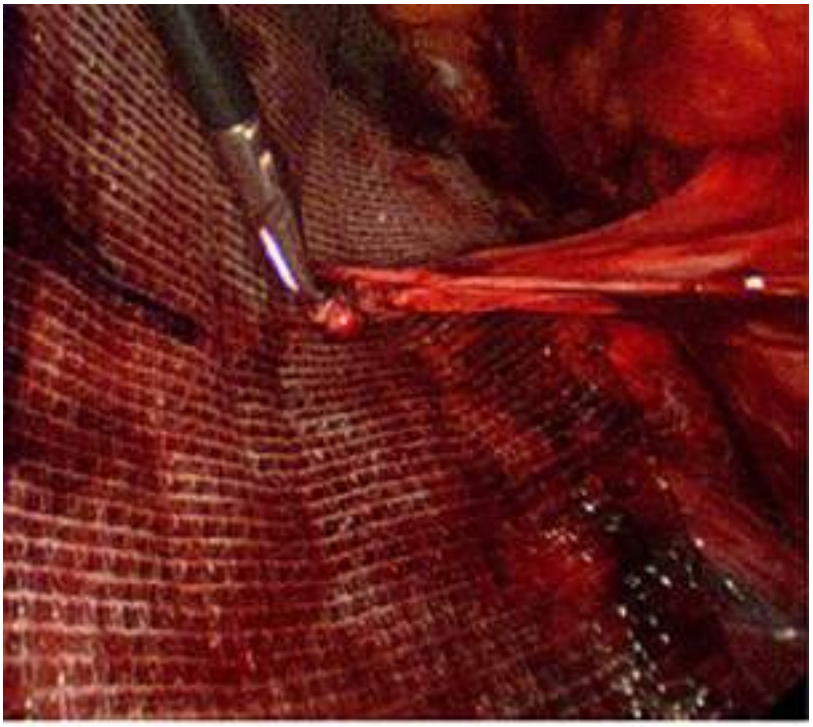

FIGURE 15: FINAL MESH POSITION, ENSURING SAC HELD AWAY BEFORE REVERSAL OF PNEUMO

Finally, pre-peritoneal space is desufflated, and the skin of the three-port sites are closed with 3-0 monocryl in an interrupted fashion. OPSITE dressings are applied.

COMPLICATIONS OF HERNIA SURGERY

INTRA OPERATIVE COMPLICATIONS AND PRECAUTIONS[72]

During the creation of preperitoneal space

This is the most important step.

1. A wide linea alba may result in breaching the peritoneum; in such a situation, it is best to close the rectus and incise the sheath more laterally.
2. Improper placement of balloon trocar causing dissection of muscle

fibers.

3. Entry into peritoneum causing pneumoperitoneum.
4. Rupture of the balloon in pre-peritoneal space.
5. Hassan's trocar must snugly fit into the incision to avoid a CO_2 leak.

To avoid these, one must ensure that the balloon is made properly and the correct space is entered by retracting the rectus muscle laterally to visualize the posterior rectus sheath. Also, the balloon trocar is inserted gently, parallel to the abdominal wall, to avoid puncturing the peritoneum. The balloon must be inflated slowly with saline to ensure smooth and even distension and prevent its rupture.

Precautions during port placement

The trocars should be of adequate length and threaded in proportion to the workspace to ensure a snug fit respectively. The skin incision should be just adequate to grip the trocar and prevent its slipping. The patient should be catheterized before surgery as the suprapubic trocar can injure a filled bladder. The pressure in the pre-peritoneal space must be such as to offer sufficient resistance during trocar insertion to avoid puncturing the peritoneum.

Correct Identification of the anatomical landmarks

The next most crucial step in any hernia repair surgery is the correct identification of anatomical landmarks. This is difficult for beginners as the anatomy is different from that seen in open surgery. The first most important step is to identify the pubic bone. Once this is seen, the rest of the landmarks are traced keeping this as a reference point. One is advised to keep away from the triangle of doom, which contains the iliac vessels, and to avoid placing tacks in the triangle of pain laterally.

Bladder Injury:

Bladder injury most commonly occurs during port placement, dissecting a large direct sac, or in a sliding hernia where the bladder forms content. It is mandatory to catheterize the bladder before a laparoscopic inguinal hernia repair to avoid a trocar injury. The

diagnosis is evident when one sees urine in the extraperitoneal space.

Bowel Injury

It is rare during hernia surgery. It can occur when reducing large hernias, inadvertent opening of peritoneum causing the bowel to come into the field of surgery and in reduction of sliding hernias. Injury is best avoided in such circumstances by opening the hernial sac close as possible to the deep ring.

Vascular Injury

This is one of the most commonest injuries occurring in laparoscopic hernia repair surgery and is often a reason for conversion. The various sites where it can occur is rectus muscle vessel injury during trocar insertion; inferior epigastric vessel injury; bleeding from venous plexus on the pubic symphysis; aberrant obturator vein injury; testicular vessel injury; and the most disastrous of all, iliac vessels, which requires an emergency conversion to control the bleeding and the immediate services of a vascular surgeon to repair the same. Most of the other bleeding can be controlled with cautery or clips. Careful dissection and adherence to the principles of surgery will help in avoiding most of these injuries.

Injury to vas deferens

The injury occurs while dissecting the hernial sac from the cord structures. The injury causes an eventual fibrotic narrowing of the vas. A complete transaction of the vas is best avoided and this may be done by identifying before dividing any structure near the deep ring or floor of the extraperitoneal space. Also, the separation of cord structures from the hernial sac must be gentle and direct; grasping of vas deferens with forceps must be avoided.

Pneumoperitoneum

It is a common occurrence in TEP that every surgeon should be prepared to handle. Putting the patient in Trendelenberg position and increasing the insufflation pressures to 15 mmHg helps in overcoming any inconvenience. If the problem persists, a verses needle can be inserted at Palmer’s point

POST-OP COMPLICATIONS

Wound infection[73]

Infection is one of the most common complications following hernia repair. It is nearly always secondary to bacteria that contaminate the wound during the operative procedure. Infection may vary from a minimal discharge of pus to an extensive and invasive process requiring lengthy hospitalization, intravenous antibiotics, and repeated operations.

The incidence of wound infection after hernia repair is inconsistently reported and is influenced by population-specific variables that may affect observations. The use of mesh is thought by most surgeons to increase wound infection rates but has largely been supported only by testimony.

Cord and testicular complications[74]

Cord structures include the vas deferens, the testicular artery, pampiniform plexus of veins, Ilioinguinal and genital branches of the genito-femoral nerve and any of these structures may be injured during hernia repair in the groin.

Complications include:

1. Hydrocele
2. Haematocele (scrotal hematoma)
3. Transection of the vas
4. Nerve injuries
5. Damage to testicular blood supply (ischemic orchitis and testicular atrophy)

Post-operative pain

Post-operative pain may be a significant reason for delayed discharge from the hospital, increased morbidity, and reduced patient satisfaction with ambulatory hernia surgery. The post-operative analysis aims to achieve pain relief without nausea and drowsiness and to avoid breakthrough pain during convalescence.

Residual neuralgia following hernia repair represents the most vexing complication of the inguinal region. 4 types of neuralgias have been described by Chevre.[75]

a) Neuroma pain

Caused by the proliferation of nerve fibers outside the neurilemma following complete or partial nerve section. Pain is exquisite at the site of the neuroma and stimulates an electric shock.

b) Differentiation pain

A burning pain following partial or complete nerve section or entrapment in a ligature with chronic paroxysmal exacerbations.

c) Projected pain

The intact nerve is encased in a callus or entrapped in a ligature. Pain is elicited by light touch along the course of the nerve.

d) Referred pain

The lesion is at a distance such as an inflammatory granuloma around a suture or the stump of the peritoneal sac

Patterns of pain and timing of onset[76]

a) Immediate onset of pain following hernia repair

- Local trauma to the tissue involved includes nerve entrapment or direct injury to Ilioinguinal, Iliohypogastric, or Genitofemoral nerve.
- Soft tissue or fascia injury due to tearing of a suture or staple abruptly away from tissue that has been transfixed with or without mesh.

b) Inguinal pain immediately following hernia repair that is similar/identical with pre-operative inguinal pain

- Lumbosacral spine disease
- Missed hernia

c) Delayed onset of pain, increasing in intensity, following surgery

- Neuralgia due to entrapment of the nerve by a fibrotic reaction
- Occult recurrent hernia

Chronic Pain[76]

The definition of pain devised by the International Association for the

Study of Pain (IASP) is as follows: pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.

Chronic pain is any pain that persists beyond the normal healing period of 12 weeks. Postherniorrhaphy groin pain is defined as pain lasting >3 months after surgery, which is one of the most important complications occurring after inguinal hernia repair, and occurs with greater frequency than previously thought. A review of studies published between 1987 and 2000 showed an overall incidence of 25 percent with 10 percent of patients having pain fitting a definition of moderate or severe. Incidence of chronic postoperative neuralgia reported for Lichtenstein repair of inguinal hernia ranges from 6 to 29 percent Inguinodynia is the recommended generic term for chronic groin pain after hernia repair and should replace “neuralgia or mesh inguinodynia” to promote uniformity and avoid confusion in the literature.

There are various factors related to the development of chronic pain following inguinal hernia repair. Pre-emptive analgesia, type of anesthesia, preservation of nerves, and prevention of postoperative complications are related to the development of chronic pain. The most important factor in the development of chronic pain is immediate postoperative pain; all measures must be taken to eliminate immediate postoperative pain.

PREVIOUS STUDIES

Jorge daes[69] Between October 2010 and September 2014, performed 307 eTEP repairs in 276 patients. This unselected series included all patients with inguinal hernias. Six cases were converted to TAPP, and none were converted to open surgery. The hernia recurred in two cases. There was one bladder lesion that was corrected during the procedure and five self-limiting seromas. None of the patients have experienced chronic pain. Hence he concluded “The eTEP technique has a place in the armamentarium of hernia surgeons. Residents and surgeons early in their experience will find this technique easier to master than the classic TEP method. It can expand the traditional

indications of the extraperitoneal approach to patients with a difficult body habitus, a short umbilicus-pubis distance, and previous pelvic surgery. As the surgeon's experience increases, the indications for the traditional TEP technique can be expanded to more complex cases".

Reza et al.[77] found that Among 25 patients average time of operation was 1 hour and 35 minutes, peroperative blood loss was below 20 ml in all patients, peritoneal tear occurred in 2 patients, 1 vessel injury but no nerve injury was observed during the procedure. One patient had mild chronic pain even after the end of 3rd month. One patient developed scrotal swelling which subsided by the end of 1st week. No SSI, mesh infection, seroma, wound hematoma, and recurrence found within this period. Hence, they concluded that "eTEP procedure is cost effective, has minimum complication with easier learning. In the hands of an experienced surgeon, eTEP repair can be safe and effective. New study can be done to find out it's effectiveness in incisional hernia in lower abdomen and bilateral inguinal hernia".

MATERIAL AND METHODS

Material and method

It is an observational study of 50 patients admitted to DMC&H, Ludhiana in the period between 1st January 2020 to 31st July 2021.

All patients presenting to DMC&H Ludhiana for the repair of inguinal hernia by the eTEP approach were included in the study.

Inclusion criteria

All Patients with inguinal hernia presenting to DMC&H OPD for endoscopic repair of hernia

Exclusion criteria

ASA grade IV or more (severe co-morbid conditions)

Complicated hernias (obstructive; strangulated)

Loss of domain, ulcerated skin, active infection, orchitis

Contraindications for general anesthesia

PREOPERATIVE WORKUP

Routine **investigations** including hemogram, renal function tests, coagulation profile, chest x-ray, and electrocardiogram are done in all patients. Patients are kept nil per orally to solids 8 hours before surgery and clear liquids 2 hours prior.

All procedures are done under General Anesthesia and catheterization is done before the start of the procedure.

SURGICAL STEPS

1. **PORT PLACEMENT**

A 10-mm skin incision is made 5 cm lateral and cranial to the umbilicus (on the ipsilateral side of hernia/larger hernia in case of B/L hernias). Direct cut down is done till preperitoneal space and after bluntly dissecting it with a finger 10 mm port is inserted. With gas insufflation set to pressure 15 mm Hg and high flow, a 30-degree telescope is inserted and dissection in the pre-peritoneal plane done with the tip of the telescope in the caudal and medial directions around the umbilicus. A 5-mm working port is inserted infra-umbilically. A second port 5 mm lateral is inserted into the contralateral lower quadrant. In bilateral hernias, this port is

positioned below the first port in the midline

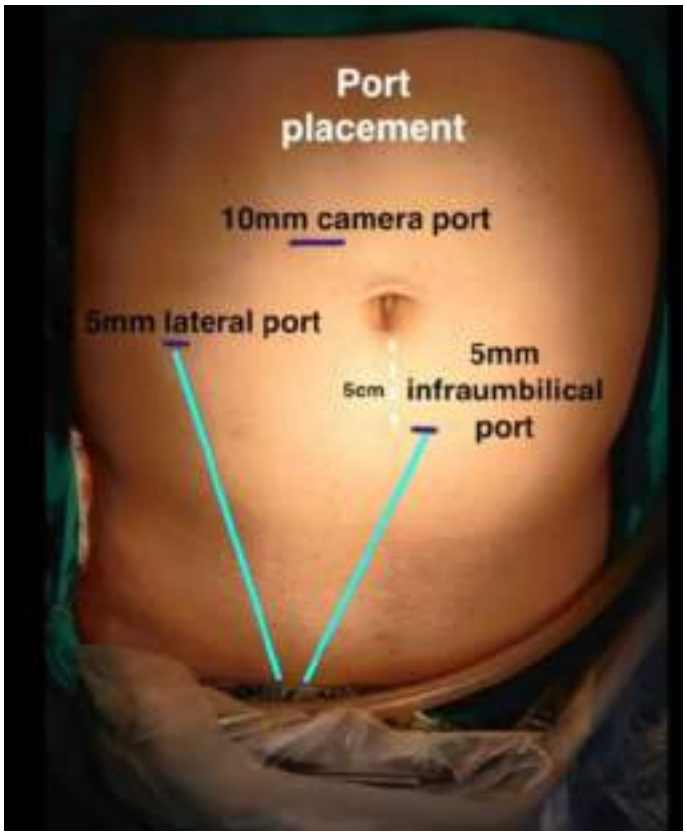

FIGURE 16: PORT PLACEMENT IN RIGHT-SIDED HERNIA

2. Using the combination of blunt dissection and energy source (Ligasure/enseal) space of Retzius is developed, identifying the pubic bone and Cooper's ligament. The space of Bogros is then developed by dissecting the transversalis fascia of the peritoneum.
3. The telescope is moved to the umbilical port. Generous lateral dissection of space of Bogros with a combination of blunt counter traction and energy source division. The arcuate ligament is carefully divided with an energy source. Repair with 3.0 V-Loc suture was done if peritoneum was breached, to maintain pneumo in pre-peritoneal space.
4. Once the pre-peritoneal space is fully developed, the patient is assessed for the presence of direct or indirect inguinal/femoral/obturator hernia.

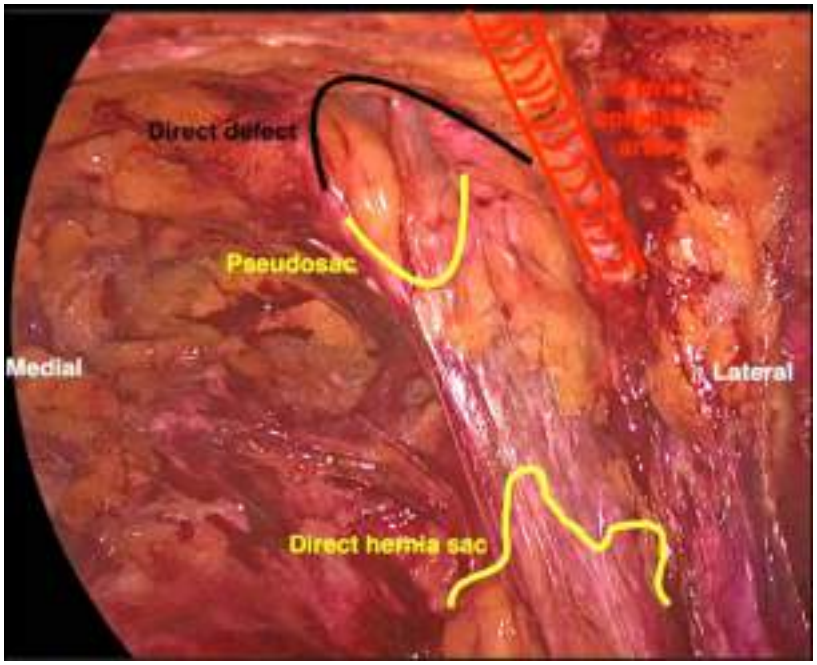

FIGURE 17 VIEW OF HERNIAL DEFECT AFTER DISSECTION

5. Ensuring all hernias and their content were reduced with counter traction and cord elements were parietalized. If a chronic sac was encountered, the sac was transacted as distal as possible and stitch closed with a V-Loc suture.
6. The mesh was inserted and deployed on the anterior abdominal wall and then unfolded carefully. After unfolding the mesh and careful placement covering all the sites including femoral and obturator canals the mesh was secured to Cooper's ligament with an absorbable tack. Special care should be taken that all peritoneal folds lie in front of the mesh.

FIGURE 18 MESH PLACEMENT AFTER REDUCTION OF HERNIA

7. Hemostasis is achieved and confirmed. Then with the Maryland grasper keeping the mesh in place, the pre-peritoneal space is desufflated, the scrotum is squeezed to put air back into the preperitoneal space. Once done, pneumo was re-established to check that the mesh is in the optimal position.
8. Finally, after pre-peritoneal space is desufflated, the skin of the three-port sites was closed with 3-0 ethilon interrupted sutures and OPSITE dressings are applied.

OBSERVATIONS AND RESULTS

The study was conducted at Dayanand Medical College and Hospital, Ludhiana on 50 patients who presented to DMCH for laparoscopic inguinal hernia repair between 1ST January 2020 to 31ST July 2021. Following are the results observed:-

PATIENT DEMOGRAPHICS

1. AGE

15(30%) out of the 50 patients in our study were over the age of 60 years. 23 (46%) out of the 50 patients were in the age group of 41-60 years whereas 12 patients (24%) were below 40 years of age.

Table 1 AGE DISTRIBUTION

Age group	No. of cases	Percentage
< 40	12	24%
41-60	23	46%
> 60	15	30%
Total	50	100.0%

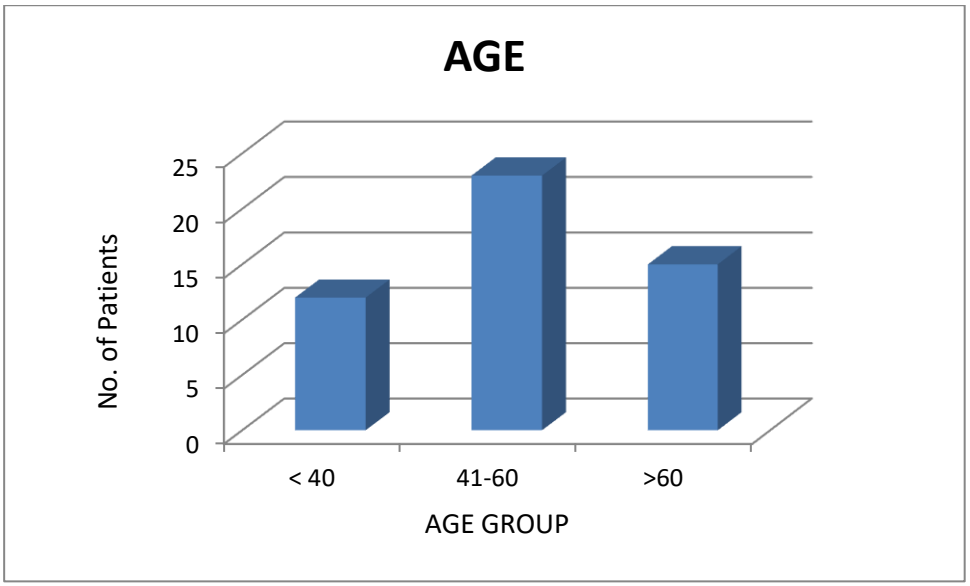

FIGURE 19 AGE DISTRIBUTION

2. SEX

All patients were male in our study

Table 2 SEX DISTRIBUTION

SEX	No. of cases	Percentage
M	50	100%
Total	50	100.0%

3. BMI

In our study, 19(38%) patients had BMI ranging between 25-29.9, and 12(24%) had BMI between 30 to 34.9. 10(20%) patients were morbidly obese with BMI > 35. Out of the total 50 patients, 8(16%) patients had normal BMI ranging between 18.5 to 24.9. Whereas 1 patient had BMI<18.5. The mean BMI of patients included in the study was 29.40 kg/m^2.

TABLE 3 BMI

BMI	No. of cases	Percentage
<18.5	1	2
18.5-24.9	8	16
25-29.9	19	38
30-34.9	12	24
>35	10	20
total	50	100

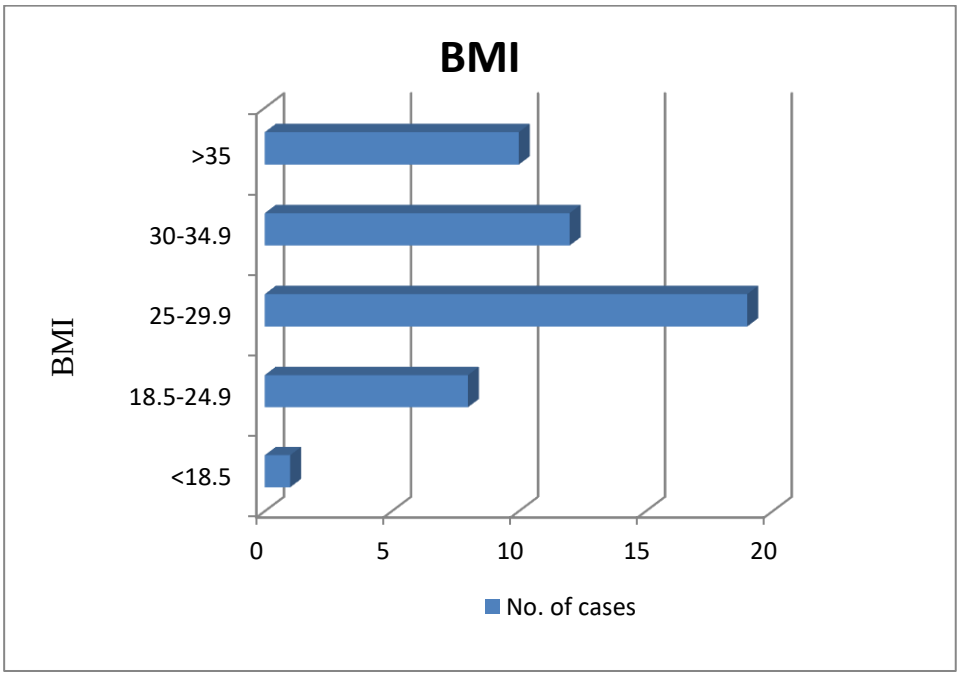

Figure 20 BMI DISTRIBUTION

4. RISK FACTORS

3 patients had COPD, whereas 16 patients had complaints of chronic constipation in our study.

A history of smoking was present in 6 cases.

History of regular alcohol intake was present in 29 patients

6 of the total patients were addicted to either nicotine or opioid.

22 patients were classified as obese, with BMI >30.

TABLE 4 RISK FACTORS

RISK FACTORS	No. of cases
COPD	3
CHRONIC CONSTIPATION	16
SMOKING	6
ALCOHOL	29
NICOTINE	6
OBESE	22

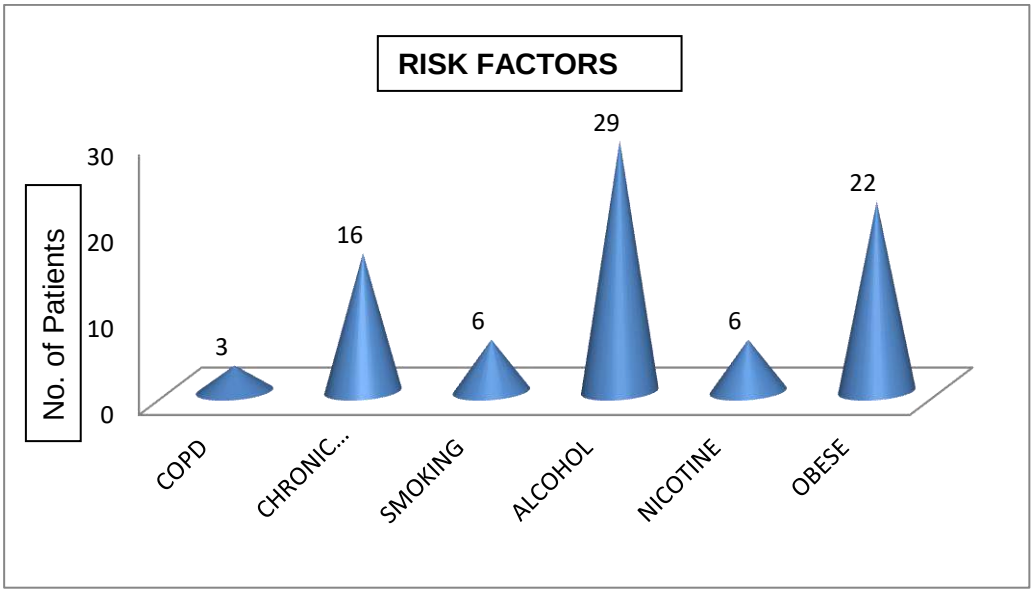

FIGURE 21 RISK FACTORS

HERNIA CHARACTERISTICS

5. SITE OF HERNIA

13(26%) out of the 50 cases had a left-sided hernia and 18(36%) patients had a right-side hernia. Whereas the remaining 19(38%) patients had B/L hernias.

Table 5 SITE OF HERNIA

CLINICAL DIAGNOSIS	No. of cases	Percentage
B/L HERNIA	19	38.0%
LEFT-SIDED HERNIA	13	26.0%
RIGHT-SIDED HERNIA	18	36.0%
Total	50	100.0%

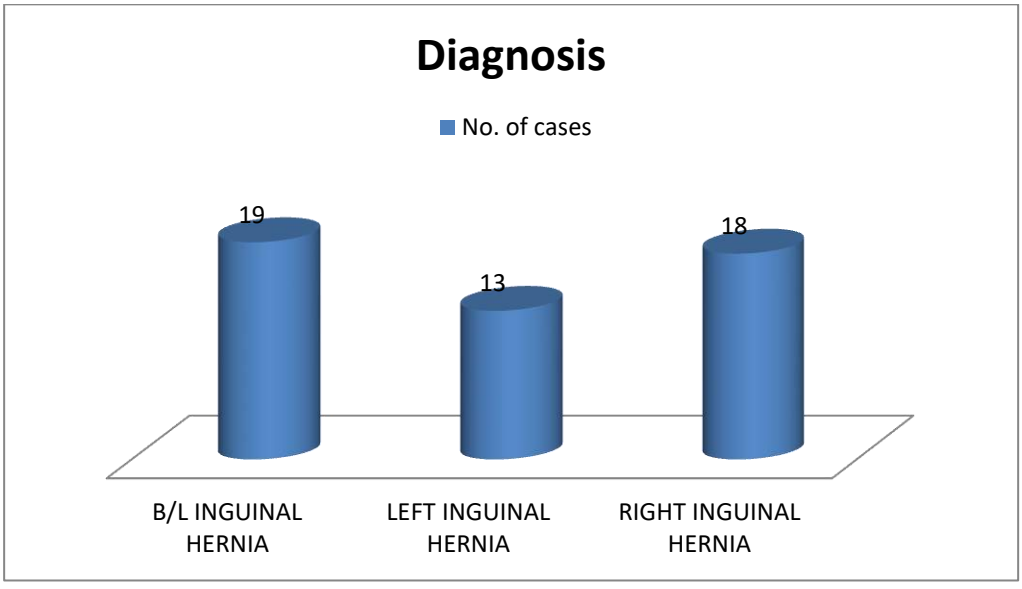

FIGURE 22 SITE OF HERNIA

6.EXAMINATION OF HERNIA

Only patients with reducible, non-obstructed, non-strangulated hernias were included in the study.

Cough Impulse was present in all the cases.

Scar of previous surgery was present over the swelling in 6(12%) patients.

Tenderness over the swelling was elicited in 2(4%) patients

Table 6 HERNIA CLINICAL FINDINGS

Examination	NO. OF CASES	PERCENTAGE
REDUCIBLE	50	100%
COUGH IMPULSE PRESENT	50	100%
SCAR OVER SWELLING	6	12%
TENDERNESS	2	4%

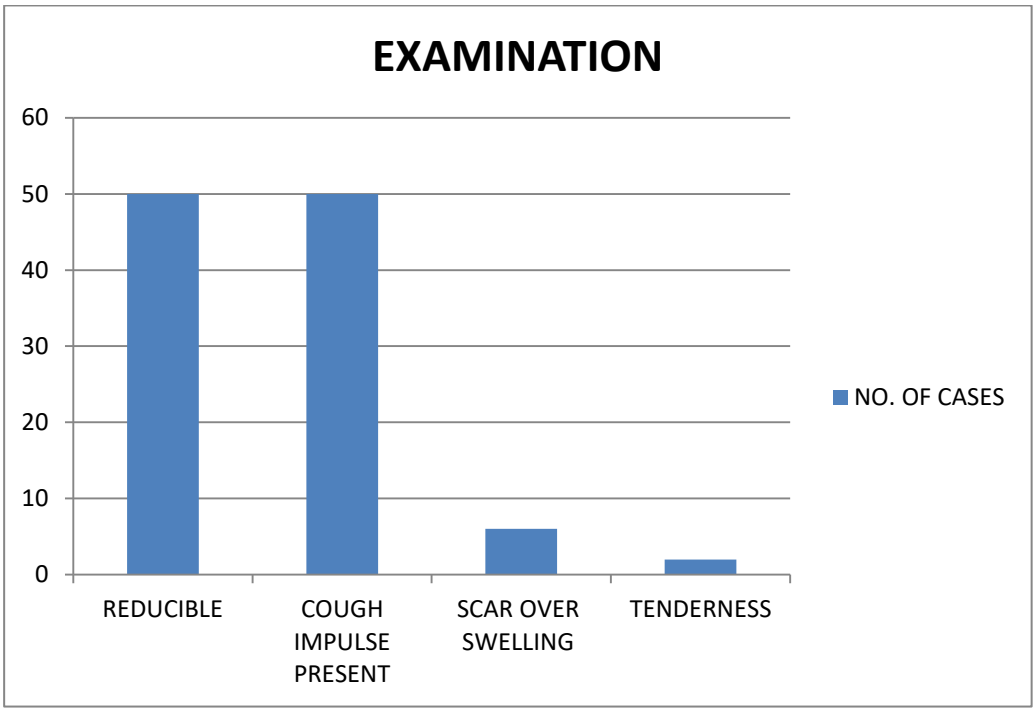

FIGURE 23 HERNIA CLINICAL FINDINGS

7. TYPE OF ANAESTHESIA

All patients were operated on under general anesthesia.

Local anesthesia was given before the skin incision.

Table 7 Type of anesthesia

Type of anesthesia	No. of cases	Percentage
GA	50	100%
Total	50	100.0%

8. MEAN OPERATIVE TIME

Mean operative time in the case of Unilateral Hernia was 45.1 minutes and in the case of Bilateral Hernia Repair was 70.47 minutes.

We also observed that the operating time went down with increasing experience.

Table 8 MEAN OPERATING TIME (in minutes)

	N	Minimum	Maximum	Mean
DURATION OF SURGERY(MINS)-BILATERAL	19	52	88	70.47
DURATION OF SURGERY(MINS)-UNILATERAL	31	35	62	45.10

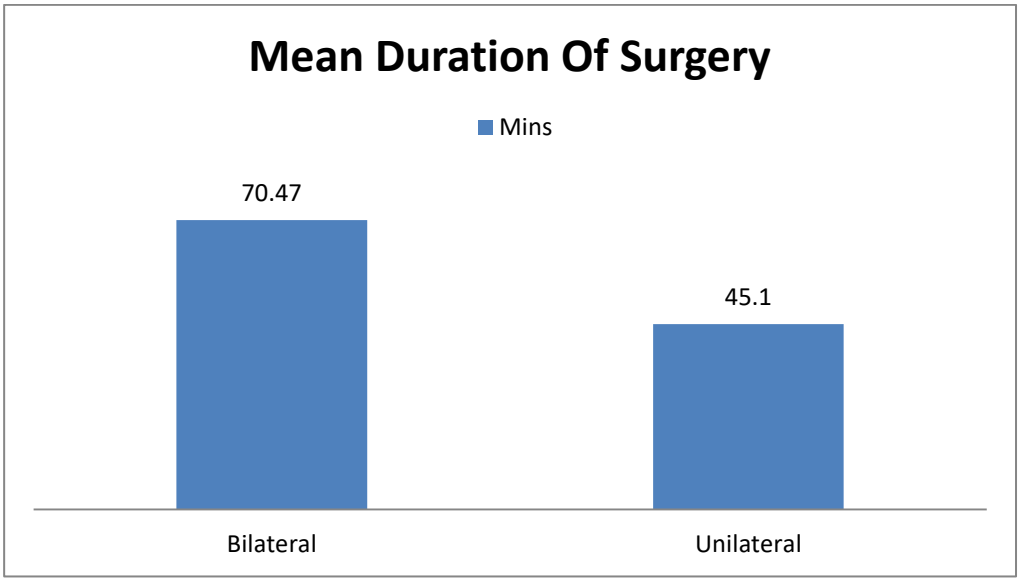

Figure 24 MEAN OPERATING TIME (in minutes)

9. DEFECT SIZE AND MESH SIZE

29(42%) times the defect size through which contents herniated was approx. 2 cm, while 16(23.2%) and 15(21.7%) times the defect was approx. 3 and 4 cm respectively. 4(5.8%) times the defect was small measuring approx. 1 cm in size. Whereas, 5(7.2%) times the hernial defect was larger than 4 cm. mean defect size was 2.91 cm

TABLE 9 DEFECT SIZE DISTRIBUTION

DEFECT SIZE(CM)	No. of cases	Percentage
1	4	5.8%
2	29	42.0%
3	16	23.2%
4	15	21.7%
5	1	1.4%
6	2	2.9%
7	2	2.9%
Total	69	100.0%

Mesh of size 10.8 X 16 cm was used in cases with defect size up to 4 cm whereas mesh size of 12.2 X 17 cm was preferred in cases with defect size of 4 cm or above.

Table 10 SIZE OF MESH

SIZE OF MESH	No. of cases	Percentage
10.8 x 16	49	71.0%
12.2 x 17	18	26.1%
Total	69	100.0%

Post-op findings

10. LENGTH OF HOSPITAL STAY

27(54%) of the patients were discharged on POD-1 on oral antibiotics and analgesics.

15(30%) of the patients were discharged on POD-2.

4(8%) patients got discharged by POD-3, whereas 4(8%) patients required hospitalization more than 3 days in the post-op period.

Post-op mean length of stay was 1.82 days, ranging from 1-8 days.

Table 11 MEAN LENGTH OF STAY (IN DAYS)

	N	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
LENGTH OF HOSPITAL STAY (POST-OP) IN DAYS	50	1.00	8.00	1.82	1.33

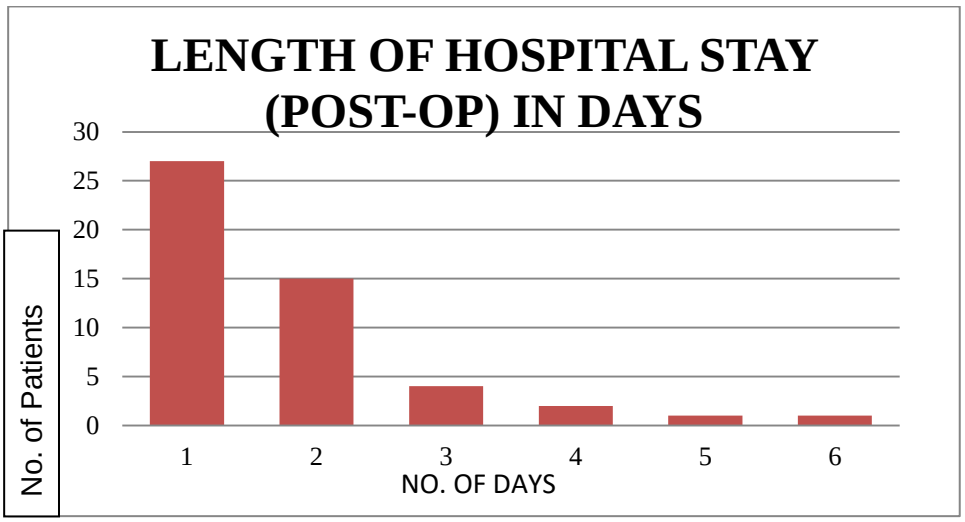

Figure 25 MEAN LENGTH OF STAY (in days)

46 (92%) of the 50 cases operated got discharged within 4 days of admission.

11. DAY OF MOBILIZATION

The patients started mobilizing between post-op days 0 to 2 with the majority of them (36 patients (72%)) mobilizing by post-op day 1. The mean day of mobilization was 1.20 days

TABLE 12 DAY OF MOBILIZATION

DAY OF MOBILIZATION	No. of cases	Percentage
0	4	8.0%
1	32	64.0%
2	14	28.0%
Total	50	100.0%

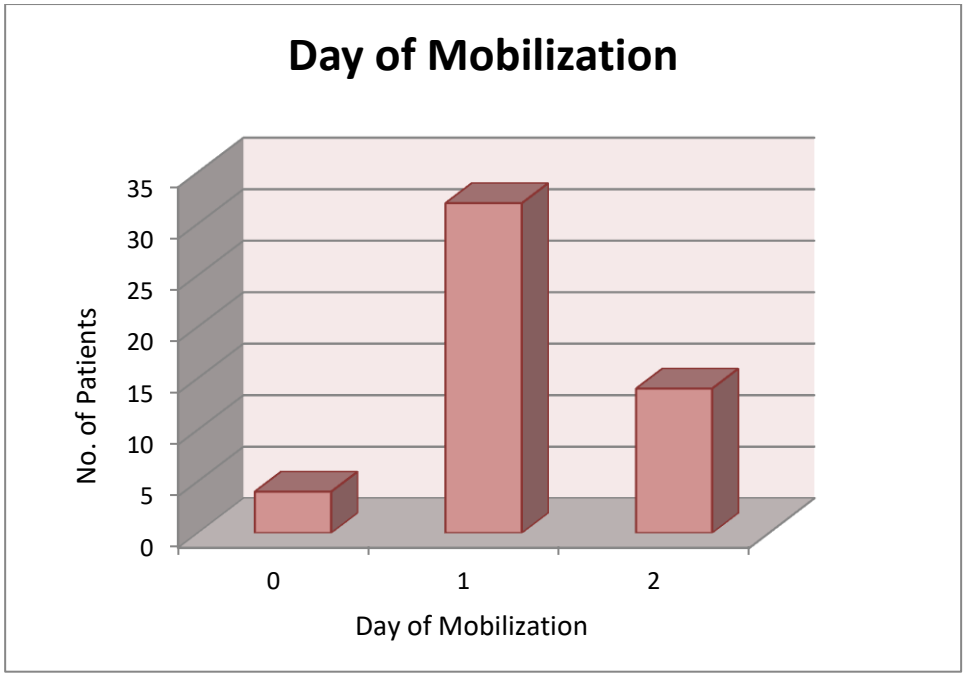

FIGURE 26 DAY OF MOBILIZATION

12. COMPLICATIONS

Patients were followed for a minimum period of 3 months postoperatively, after 2 weeks, at the end of 1st and 3rd month.

Seroma formation was seen in 4(8%) patients and was managed conservatively

4(8%) patients had complaint of pain after 2 weeks of surgery, which was managed with mild analgesics

No patient had any complaints at the end of the 1st and 3rd months.

Table 13 POST-OPERATIVE COMPLICATIONS

Complication	2 WEEKS
SEROMA	4
SURGICAL SITE INFECTION	0
BOWEL COMPLICATION	0
NEED FOR RE-SURGERY	0
MESH INFECTION	0
RECURRENCE	0
CHRONIC PAIN	4

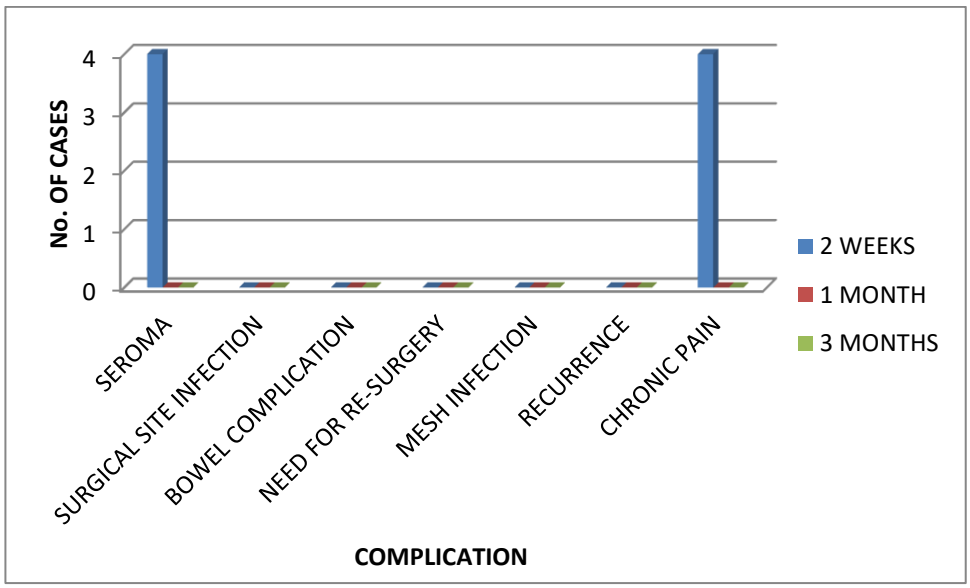

FIGURE 27 POSTOPERATIVE COMPLICATIONS

No intra-operative complications occurred for which the case has to be converted to open

No drains were placed during any of the procedure

There were no re-admissions during the follow-up period of at least 3 months post-operatively.

Hematoma, deep abscess, surgical site infection, port site herniation, and wound dehiscence were not seen in any case.

No wound-related, systemic complications like UTI, stroke, pneumonia, CHF, etc. were seen in any of the patients.

No patient required post-op ICU stay in our study.

1. **POST OP PAIN**

The pain was assessed using the visual analog scale. The majority of patients 34(68%) had mild pain/discomfort on POD-1 and were shifted on oral analgesics. While the remaining 16(32%) of the patients complained of moderate pain requiring I/V analgesics. No patient complained of severe or unbearable pain on POD-1.

TABLE 14 SEVERITY OF PAIN ON POD-1

SEVERITY OF PAIN(POD-1)	No. OF CASES
no pain(0)	0
Mild(1-3)	34
Moderate(4-6)	16
Severe(7-9)	0
Worst(10)	0

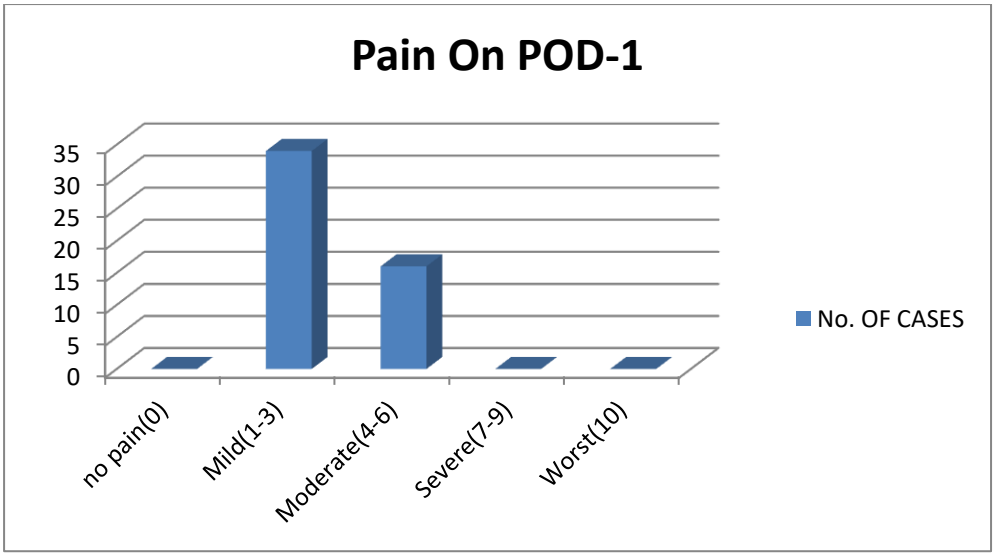

FIGURE 28 SEVERITY OF PAIN ON POD-1

Chronic pain was seen in 4(8%) patients at the end of 2 weeks and was bearable (VAS score less than 3) and relieved with mild analgesics.

No patient complained of significant pain at the 1st and 3rd months postoperatively.

TABLE 15 SEVERITY OF PAIN AFTER 2 WEEKS

CHRONIC pain VAS score	No. of cases	Percentage
0	46	92%
1	1	2%
2	2	4%
3	1	2%
Total	50	100.0%

2. SURGICAL SITE INFECTIONS

There were no surgical site infections noted in our study.

3. RECURRENCE

No recurrence was recorded in our cohort at a minimum follow-up of 3 months.

DISCUSSION

In inguinal hernia repair, the laparoscopic method provides clear advantages over the open approach. TEP is a commonly used procedure for inguinal hernia repair, although it has a few drawbacks, including limited port placement, limited area for dissection, poor tolerance to accidental pneumoperitoneum, and a steep learning curve. Hence, we describe the eTEP technique which is a variation of the TEP approach that overcomes the aforementioned drawbacks. Between January 2020 to July 2021, observational research was undertaken at Dayanand Medical College and Hospital, Ludhiana on 50 patients who underwent inguinal hernia repair using the eTEP technique.

PATIENT CHARACTERISTICS

AGE - Of the 50 patients in our research, 15 (or 30%) were above the age of 60. 23 (46%) of the 50 patients were between the ages of 41 and 60, while 12 (24%) were under the age of 40. Similar findings were made by Ira M.Rutkow [11], who found that the age group 45 to 64 had the highest frequency, with 30% cases. 44% of patients are under 45 years of age and 26% are over 65 years old.

As the age advances progressive weakening of abdominal muscles takes place which is believed to be the main reason that hernias are more prevalent after the age of 40 years.

SEX We evaluated a total of 50 patients, all of whom were males, comparable to a study by Reza SM [77] et al. in which all of the patients were also males.

Our study's sex incidence matches that of the peer-reviewed research. It could be due to the fact that inguinal hernia is more common in males than females, or it could be due to the ignorance and shy nature of Indian females, as a majority of females with groin hernia present in the emergency department with complications rather than in the outpatient department, which explains why there are no female patients included in our study.

BMI

In our study, 19 patients (38%) had a BMI of 25 to 29.9, while 12

patients (24%) had a BMI between 30 to 34. 10 patients (20%) out of total patients were morbidly obese, having a BMI of greater than 35. 8 patients (16%) had a normal BMI ranging from 18.5 to 24.9, out of a total of 50. 1 (2%) of the patients had a BMI of 18.5.

In his study, Jorge Daes[69] known as the pioneer of the eTEP technique, determined that eTEP is a superior approach in obese and short-statured patients with a short umbilical to pubis distance.

As a result, patients with these characteristics were included in our study, which corresponds to Jorge Daes' observation.

RISK FACTORS

During our analysis, we discovered that the majority of patients who presented with hernia also had some of the other known risk factors for developing a hernia.

Three of the patients had chronic obstructive lung disease, while the other 16 suffered from chronic constipation. Thirty-nine people had a history of drinking, while six others smoked and six others were nicotine/opioid addicts. Obesity was found to be a risk factor in 22 patients.

This is a new variable included in our study which can help us predict recurrence risk over a longer period as these risk factors are more likely to persist following surgery.

HERNIA CHARACTERISTICS

SIDE OF HERNIA

In our study, 18 patients (36%) had a right-sided hernia and 13 patients (26%) had a left-sided hernia. Bilateral inguinal hernias were seen in 19 of the 38 individuals.

This approach is more useful in patients with B/L hernias, as noted by Jorge Daes in his study [69], hence patients with B/L hernias were favored.

MEAN OPERATING TIME

In our study, operating time for unilateral hernia repairs ranged from 35 to 62 minutes, with a mean of 45.10 minutes, whereas the operating time for bilateral hernia procedures ranged from 52 to 88 minutes, with a mean of 70.47 minutes.

Jorge Daes [78] discovered that with the e-TEP approach, the average time for unilateral hernia repair was 38 minutes.

It was observed in our study that the operating time was longer in initial cases but as knowledge and expertise increased the operating time dropped matching Jorge Daes' time.

DAY OF MOBILIZATION

The patients started mobilizing between post-op days 0 to 2 with the majority of them (36 patients (72%)) mobilizing by post-op day 1. The mean day of mobilization was 1.20 days.

Jorge Daes [69] mentions early mobilization as an advantage of the eTEP approach, which is consistent with our findings.

LENGTH OF STAY

In our study, 27 (54%) patients were discharged on POD-1, 15 (30%) patients were discharged on POD-2, and 4 (8%) patients were discharged on POD-3, whereas 4 (8%) patients needed hospitalization for more than 3 days.

After surgery, the average duration of stay was 1.82 days, with a range of 1 to 8 days.

The lengthened stay was observed in patients with significant medical comorbidities requiring medical attention not pertaining to surgical problems.

Reza SM et al [77] in their study concluded that The average length of stay was 2 days for 15 patients (60%), 3 days for 8 (32%), and 5 days for 2 patients (8 percent). 2.56 days was the average length of stay in the hospital postoperatively.

Our findings are consistent with those of the reference study. The low length of stay was due to early patient mobilization and reduced pain in the post-operative stage.

COMPLICATIONS

INTRAOPERATIVE

In our study, no intra-operative complications warranted conversion to open/TAPP repair and no drains were utilized during any of the procedures.

According to Jorge Daes[69], during his study six out of 307 eTEP

repairs were converted to TAPP, while none were converted to open surgery.

This disparity might be due to Jorge Daes' large sample size, in comparison to our study.

POST-OPERATIVE

POST OP PAIN (DAY 1)

The pain was assessed using the visual analog scale. On POD-1, the majority of patients 34(68%) had mild pain/discomfort and were shifted to oral analgesics. While the remaining 16(32%) of the patients complained of moderate pain requiring I/V analgesics.

C. G. Schmedt et al.[79] compared endoscopic methods to Lichtenstein and other open mesh techniques for inguinal hernia repair and found that endoscopic therapies caused less post-operative pain than any open approach.

CHRONIC PAIN

In our study, the pain was experienced by 4 patients at the end of 2 weeks. It was mild in intensity requiring no/minimal analgesics and completely resolved within 1 month. No patient complained of pain by end of the first month and on minimum follow-up after 3 months.

Our findings are consistent with the reference study, as Jorge Daes[69] also in his study reported that no patient complained of chronic pain.

This is mainly due to better visualization of groin anatomy and sparing of nerves.

SEROMA

After two weeks, seroma formation occurred in four patients in our study and was managed conservatively. There were no incidences of hematoma, deep abscess, surgical site infection, port site herniation, or wound dehiscence during our follow-up.

Jorge Daes [69] reported five self-limiting seromas throughout his study.

This is due to the availability of wide-area for dissection, that handling of distal sac becomes easy especially in cases of large inguinoscrotal and sliding hernias. The sac is pulled out of the canal and either excised or tacked to the anterior abdominal, thus closing the defect and

preventing seroma formation.

This, too, is dependent on the surgeon's expertise and understanding.

WOUND RELATED COMPLICATIONS

No Wound related complications were seen in our study which is consistent with that reported by Jorge Daes[69].

RECURRENCE

After a minimum of three months of follow-up in our study, there was no recurrence. However, the length of follow-up is insufficient to make any conclusions about the risk of recurrence after repair with this approach.

In his study, Jorge Daes[69] reported two recurrences in his study of 307 repairs in 276 patients with the eTEP approach. This disparity be due to larger sample size and longer follow-up in his study.

SUMMARY AND CONCLUSION

We describe the eTEP technique which is a variation of the TEP approach that overcomes the drawbacks of the latter. Between January 2020 to July 2021, observational research was undertaken at Dayanand Medical College and Hospital, Ludhiana on 50 patients who underwent inguinal hernia repair using the eTEP technique, on whom relevant routine investigations were performed. We conclude that eTEP is a better and safer alternative than the other hernia approaches as it is associated with a shorter stay, fewer complications in the form of surgical site infections/seroma/hematoma formation, early mobilization, and early return to work.

15(30%) out of the 50 patients in our study were over the age of 60 years. 23 (46%) out of the 50 patients were in the age group of 41-60 years whereas 12 patients (24%) were below 40 years of age. All of the patients were males. 19(38%) patients had BMI ranging between 25-29.9 and 12(24%) had BMI between 30 to 34.9. 10(20%) patients were morbidly obese with BMI > 35. Out of the total 50 patients, 8(16%) patients had normal BMI ranging between 18.5 to 24.9. Whereas 1(2%) patients had BMI<18.5.

During our analysis, we discovered that the majority of patients who presented with hernia also had some of the other known risk factors for developing a hernia. Three of the patients had chronic obstructive lung disease, while the other 16 suffered from chronic constipation. Thirty-nine people had a history of drinking, while six others smoked and six others were nicotine/opioid addicts. Obesity was found to be a risk factor in 22 patients.

18(36%) patients had a right-sided hernia and 13(26%) had a left-sided hernia. 19(38%) patients had bilateral inguinal hernias.

Operating time in our study ranged from 35 to 62 minutes with a mean of 45.10 minutes in case of unilateral hernia repairs, whereas it ranged between 52 to 88 minutes with a mean of 70.47 minutes in cases of bilateral hernias.

The patients started mobilizing between post-op days 0 to 2 with the

majority of them (36 patients (72%)) mobilizing by post-op day 1. The mean day of mobilization was 1.20 days. Whereas, 27(54%) patients were discharged on POD-1. 15(30%) patients were discharged on POD-2 and 4(8%) patients got discharged by POD-3, whereas 4(8%) patients required hospitalization for more than 3 days pertaining to existing medical comorbidities. Post-op mean length of stay was 1.82 days, ranging from 1-8 days.

No intra-operative complications occurred in our study that required conversion to open/TAPP. No drains were placed during any of the procedures. The majority of patients 34(68%) had mild pain/discomfort on POD-1 and were shifted to oral analgesics. While the remaining 16(32%) of the patients had moderate pain requiring I/V analgesics. No patient complained of severe or unbearable pain on POD-1. The pain was experienced by 4 patients at the end of 2 weeks. It was mild in intensity requiring minimal analgesics and completely resolved within 1 month.

Seroma formation was seen in 4 patients at the end of 2 weeks which was managed conservatively. There was no case of hematoma formation, deep abscess formation, surgical site infection, port site herniation, or wound dehiscence in our study. No wound-related complications were seen and there was no recurrence recorded in our study at a minimum follow-up of 3 months.

In the end, we conclude that in patients with inguinal hernias as described in our study, the e-TEP approach is a safe, better, and more feasible method as compared to other approaches. It is associated with a shorter hospital stay, fewer post-operative complications such as surgical site infections/seroma/hematoma formation, early mobilization, and early return to work along with being a minimally invasive technique. This approach provides a large, previously unassessed virgin plane for dissection and working. The handling of the distal sac becomes easier due to the availability of wider working space, excision, and tacking of the sac becomes easy especially in cases of large inguinoscrotal and sliding hernias, thus reducing chances of recurrence and seroma formation. The extraperitoneal space also provides a large

area for mesh placement and strengthens the fascia with minimal trans-fascial fixation. It also deals with all groin hernias including femoral and obturator at once.

Although we should wait for the long-term outcomes, short-term outcomes seem promising and eTEP may also be considered the technique of choice for bilateral as well as recurrent inguinal hernias considering its minimal morbidity and low recurrence rates.

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S. NO.	MRD NO.	NAME	AGE	SEX	DATE OF ADMISSION	DATE OF SURGERY	DATE OF DISCHARGE	CHIEF COMPLAINTS	PAST HISTORY			PERSONAL HISTORY			BUILT (BMI)	
									COPD/ ASTHMA	CHRONIC CONSTIPATION	H/O PREVIOUS LOWER ABDOMEN/PELVIC SURGERIES	SMOKING	ALCOHOL	NICOTINE/ OPOID		PER ABDOMEN (ANY SCAR OVER ABDOMEN)
1	870938	AG	55	M	1/1/2020	1/2/2020	1/3/2020	B/L INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	32	NO
2	873489	HS	59	M	1/2/2020	1/3/2020	1/4/2020	B/L INGUINAL SWELLING	NO	NO	NO	YES	YES	NO	35	NO
3	879652	SS	51	M	1/15/2020	1/16/2020	170/01/2021	LEFT INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	29	NO
4	884626	AS	73	M	1/21/2020	1/22/2020	1/24/2020	LEFT INGUINAL SWELLING	NO	YES	YES	NO	NO	NO	24	YES
5	887908	DS	62	M	1/27/2020	1/28/2020	1/29/2020	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	31	NO
6	889650	BS	55	M	2/2/2020	2/3/2020	2/4/2020	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	39	NO
7	862326	BDS	70	M	2/4/2020	2/5/2020	2/6/2020	B/L INGUINAL SWELLING	YES	NO	YES	NO	NO	NO	27	YES
8	893884	KS	31	M	2/6/2021	2/7/2021	2/9/2021	LEFT INGUINAL SWELLING	NO	NO	NO	NO	YES	YES	24	NO
9	664758	AS	67	M	2/13/2020	2/14/2020	2/15/2020	LEFT INGUINAL SWELLING	NO	NO	YES	NO	NO	NO	26	YES
10	901122	HS	52	M	2/14/2020	2/15/2020	2/17/2020	LEFT INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	30	NO
11	904277	A	3	M	2/23/2020	2/24/2020	2/25/2020	B/L INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	16	NO
12	483039	TS	88	M	2/24/2020	2/26/2020	3/3/2020	LEFT INGUINAL SWELLING	NO	YES	YES	NO	NO	YES	22	YES
13	906536	RS	49	M	2/26/2020	2/27/2020	2/28/2020	B/L INGUINAL SWELLING	NO	YES	NO	YES	YES	NO	38	NO
14	198025	RD	77	M	3/1/2020	3/2/2020	3/4/2020	LEFT INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	29	NO
15	910147	KS	42	M	3/3/2020	3/4/2020	3/5/2020	RIGHT INGUINAL SWELLING	NO	YES	NO	NO	YES	NO	35	NO
16	909921	SK	54	M	3/3/2020	3/4/2020	3/5/2020	LEFT INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	33	NO
17	514406	IC	49	M	3/4/2021	3/4/2021	3/5/2021	RIGHT INGUINAL SWELLING	NO	NO	YES	YES	YES	NO	30	YES
18	183809	TKJ	68	M	3/4/2020	3/5/2020	3/6/2020	B/L INGUINAL SWELLING	NO	YES	YES	NO	NO	NO	28	YES
19	921056	YK	39	M	3/6/2021	3/6/2021	3/8/2021	B/L INGUINAL SWELLING	NO	YES	NO	NO	YES	NO	36	NO
20	913998	SC	59	M	3/10/2020	3/11/2020	3/17/2020	RIGHT INGUINAL SWELLING	NO	YES	YES	NO	NO	NO	41	YES
21	863521	AK	41	M	3/19/2020	3/20/2020	3/21/2020	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	26	NO
22	1080807	OP	71	M	4/11/2020	4/12/2020	4/14/2020	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	26	NO
23	1020311	HS	51	M	4/15/2021	4/16/2021	4/17/2021	RIGHT INGUINAL SWELLING	NO	YES	NO	NO	YES	YES	36	NO
24	1116155	SM	27	M	6/2/2021	6/2/2021	6/3/2021	B/L INGUINAL SWELLING	NO	YES	NO	NO	YES	NO	23	NO
25	1138590	SS	60	M	6/17/2021	6/18/2021	6/19/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	38	NO
26	1122843	SU	53	M	6/15/2020	6/16/2020	6/19/2020	B/L INGUINAL SWELLING	NO	YES	NO	YES	YES	NO	34	NO
27	1126010	JKB	57	M	6/22/2021	6/23/2021	6/24/2021	LEFT INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	31	NO
28	1125543	YS	70	M	6/27/2021	6/28/2021	7/2/2021	LEFT INGUINAL SWELLING	NO	NO	YES	NO	NO	NO	27	YES
29	1125479	MS	31	M	6/28/2021	6/29/2021	7/1/2021	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	24	NO
30	1007881	BS	52	M	1/3/2021	1/4/2021	1/5/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	30	NO
31	1005380	CS	48	M	1/5/2021	1/6/2021	1/7/2021	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	YES	YES	25	NO
32	1009819	NS	55	M	1/7/2021	1/8/2021	1/11/2021	RIGHT INGUINAL SWELLING	NO	YES	YES	NO	YES	YES	33	YES
33	1009294	RK	53	M	1/19/2021	1/20/2021	1/22/2021	LEFT INGUINAL SWELLING	YES	YES	NO	YES	YES	NO	21	NO
34	1006827	RS	61	M	1/22/2021	1/23/2021	1/25/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	29	NO
35	643385	A	54	M	1/25/2021	1/25/2021	1/26/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	28	NO
36	1017911	SS	64	M	1/28/2021	1/29/2021	1/30/2021	RIGHT INGUINAL SWELLING	YES	YES	YES	NO	NO	NO	31	NO
37	993210	RL	68	M	1/31/2021	2/1/2021	2/3/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	26	NO
38	501063	S	26	M	2/2/2021	2/3/2021	2/4/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	28	NO
39	1029126	MS	74	M	2/16/2021	2/17/2021	2/18/2021	RIGHT INGUINAL SWELLING	NO	NO	YES	NO	YES	NO	32	YES
40	1029782	DM	24	M	2/18/2021	2/19/2021	2/21/2021	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	29	NO
41	1016897	JS	48	M	2/23/2021	3/24/2021	3/26/2021	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	27	NO
42	1035875	LA	34	M	2/28/2021	3/1/2021	3/2/2021	B/L INGUINAL SWELLING	NO	NO	NO	YES	YES	NO	27	NO
43	1036351	AJ	58	M	2/28/2021	3/2/2021	3/4/2021	LEFT INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	29	NO
44	1036152	SS	55	M	3/1/2021	3/2/2021	3/4/2021	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	YES	YES	27	NO
45	519501	VPS	68	M	3/2/2021	3/3/2021	3/6/2021	LEFT INGUINAL SWELLING	NO	YES	NO	NO	NO	NO	24	NO
46	895021	MKM	32	M	3/11/2021	3/13/2021	3/15/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	30	NO
47	1014292	BC	39	M	3/16/2021	3/17/2021	3/18/2021	RIGHT INGUINAL SWELLING	NO	YES	NO	NO	YES	NO	36	NO
48	1064800	VPS	31	M	3/25/2021	3/26/2021	3/27/2021	B/L INGUINAL SWELLING	NO	YES	NO	NO	YES	NO	24	NO
49	481526	SS	66	M	4/4/2021	4/6/2021	4/10/2021	B/L INGUINAL SWELLING	NO	NO	NO	NO	YES	NO	37	NO
50	335451	AJ	24	M	5/28/2021	5/29/2021	6/1/2021	RIGHT INGUINAL SWELLING	NO	NO	NO	NO	NO	NO	27	NO

S. NO.	MRD NO.	EXAMINATION					CLINICAL DIAGNOSIS	TYPE OF ANAESTHESIA	DURATION OF SURGERY(MINS)	DEFECT SIZE (CM)		CON
		SWELLING	REDUCIBLE/IRREDUCIBLE	IMPULSE ON COUGHING	SKIN OVER SWELLING	TENDERNESS				RIGH	LEFT	RIGHT
1	870938	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	78	2	1	OMENTUM
2	873489	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	85	3	2	BOWEL
3	879652	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	48	-	2	-
4	884626	LEFT	REDUCIBLE	PRESENT	SCAR	MILD	LEFT INGUINAL HERNIA	GA	48	-	3	-
5	887908	RIGHT	REDUCIBLE	PRESENT	NORMAL	MILD	RIGHT INGUINAL HERNIA	GA	44	1	-	OMENTUM
6	889650	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	52	3	-	BOWEL
7	862326	B/L	REDUCIBLE	PRESENT	SCAR	NO	B/L INGUINAL HERNIA	GA	81	2	3	OMENTUM
8	893884	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	51	-	3	-
9	664758	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	47	-	2	-
10	901122	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	40	-	3	-
11	904277	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	87	2	1	OMENTUM
12	483039	LEFT	REDUCIBLE	PRESENT	SCAR	NO	LEFT INGUINAL HERNIA	GA	52	-	4	-
13	906536	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	68	2	2	OMENTUM
14	198025	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	45	-	4	-
15	910147	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	47	5	-	SMALL BOWEL
16	909921	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	39	-	4	-
17	514406	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	43	2	-	OMENTUM
18	183809	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	76	3	2	SMALL BOWEL
19	921056	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	66	2	1	OMENTUM
20	913998	RIGHT	REDUCIBLE	PRESENT	SCAR	NO	RIGHT INGUINAL HERNIA	GA	42	3	-	SMALL BOWEL
21	863521	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	39	2	-	OMENTUM
22	1080807	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	44	4	-	SMALL BOWEL
23	1020311	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	49	2	-	OMENTUM
24	1116155	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	88	2	2	OMENTUM
25	1138590	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	64	4	3	SMALL BOWEL
26	1122843	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	63	4	3	SMALL BOWEL
27	1126010	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	39	-	4	-
28	1125543	LEFT	REDUCIBLE	PRESENT	SCAR	NO	LEFT INGUINAL HERNIA	GA	41	-	4	-
29	1125479	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	40	4	-	SMALL BOWEL
30	1007881	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	78	4	3	SMALL BOWEL
31	1005380	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	48	4	-	SMALL BOWEL
32	1009819	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	62	6	-	CAECUM
33	1009294	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	46	-	2	-
34	1006827	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	68	2	3	OMENTUM
35	643385	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	53	2	2	OMENTUM
36	1017911	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	50	3	-	SMALL BOWEL
37	993210	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	66	2	2	OMENTUM
38	501063	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	52	3	2	SMALL BOWEL
39	1029126	RIGHT	REDUCIBLE	PRESENT	SCAR	NO	RIGHT INGUINAL HERNIA	GA	40	4	-	SMALL BOWEL
40	1029782	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	35	2	-	OMENTUM
41	1016897	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	40	2	-	OMENTUM
42	1035875	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	76	4	3	SMALL BOWEL
43	1036351	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	53	-	6	-
44	1036152	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	43	4	-	SMALL BOWEL
45	519501	LEFT	REDUCIBLE	PRESENT	NORMAL	NO	LEFT INGUINAL HERNIA	GA	48	-	7	-
46	895021	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	58	2	2	OMENTUM
47	1014292	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	43	3	-	SMALL BOWEL
48	1064800	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	54	2	2	OMENTUM
49	481526	B/L	REDUCIBLE	PRESENT	NORMAL	NO	B/L INGUINAL HERNIA	GA	78	4	7	SMALL BOWEL
50	335451	RIGHT	REDUCIBLE	PRESENT	NORMAL	NO	RIGHT INGUINAL HERNIA	GA	40	2	-	OMENTUM

S. NO.	MRD NO.	INTRA-OP FINDINGS						COMPLICATION			OUTCOME			
		TENT	TYPE OF HERNIA (NYHUS)		SIZE OF MESH		INTRA-OP COMPLICATIONS				DAY OF MOBILIZATION	LENGTH OF HOSPITAL STAY (POST-OP) IN DAYS	SEVERITY OF PAIN (POD-1) (ON VAS SCALE)	RECURRENCE (YES/NO)
		LEFT	RIGH	LEFT	RIGHT	LEFT		2 WEEKS	1 MONTH	3 MONTHS				
1	870938	OMENTUM	3a	3a	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	2	NO
2	873489	OMENTUM	3b	3a	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	2	NO
3	879652	OMENTUM	-	2	-	10.8 x 16	NIL	NIL	NIL	NIL	1	1	4	NO
4	884626	OMENTUM	-	3b	-	10.8 x 16	NIL	NIL	NIL	NIL	1	2	4	NO
5	887908	-	2	-	10.8 x 16	-	NIL	NIL	NIL	NIL	1	1	5	NO
6	889650	-	2	-	10.8 x 16	-	NIL	NIL	NIL	NIL	1	1	3	NO
7	862326	SMALL BOWEL	4a	3b	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	3	NO
8	893884	OMENTUM	-	2	-	10.8 x 16	NIL	NIL	NIL	NIL	1	2	4	NO
9	664758	OMENTUM	-	3b	-	10.8 x 16	NIL	NIL	NIL	NIL	1	1	2	NO
10	901122	OMENTUM	-	3a	-	10.8 x 16	NIL	NIL	NIL	NIL	1	2	5	NO
11	904277	OMENTUM	2	2	-	-	NIL	NIL	NIL	NIL	0	1	3	NO
12	483039	BOWEL	-	4b	-	12.2 x 17	NIL	SEROMA, CHRONIC PAIN	NIL	NIL	2	8	2	NO
13	906536	OMENTUM	2	2	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	0	1	4	NO
14	198025	OMENTUM	-	3b	-	12.2 x 17	NIL	NIL	NIL	NIL	2	2	2	NO
15	910147	-	3b	-	12.2 x 17	-	NIL	NIL	NIL	NIL	1	1	3	NO
16	909921	SMALL BOWEL	-	3b	-	12.2 x 17	NIL	NIL	NIL	NIL	1	1	3	NO
17	514406	-	2	-	10.8 x 16	-	NIL	NIL	NIL	NIL	1	1	3	NO
18	183809	OMENTUM	3b	2	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	5	NO
19	921056	OMENTUM	2	1	12.2 x 17	12.2 x 17	NIL	NIL	NIL	NIL	1	2	5	NO
20	913998	-	3a	-	10.8 x 16	-	NIL	SEROMA	NIL	NIL	2	6	2	NO
21	863521	-	2	-	12.2 x 17	-	NIL	NIL	NIL	NIL	1	1	3	NO
22	1080807	-	3b	-	10.8 x 16	-	NIL	NIL	NIL	NIL	1	2	5	NO
23	1020311	-	2	-	10.8 x 16	-	NIL	NIL	NIL	NIL	0	1	3	NO
24	1116155	OMENTUM	1	1	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	3	NO
25	1138590	SMALL BOWEL	3b	3b	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	2	NO
26	1122843	SMALL BOWEL	3b	3b	10.8 x 16	10.8 x 16	NIL	CHRONIC PAIN	NIL	NIL	2	3	3	NO
27	1126010	SMALL BOWEL	-	3b	-	10.8 x 16	NIL	NIL	NIL	NIL	1	1	3	NO
28	1125543	SMALL BOWEL	-	4a	-	10.8 x 16	NIL	NIL	NIL	NIL	2	4	3	NO
29	1125479	-	2	-	12.2 x 17	-	NIL	NIL	NIL	NIL	2	2	3	NO
30	1007881	OMENTUM	3b	3b	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	3	NO
31	1005380	-	3b	-	12.2 x 17	-	NIL	NIL	NIL	NIL	1	1	3	NO
32	1009819	-	4b	-	12.2 x 17	-	NIL	NIL	NIL	NIL	2	3	3	NO
33	1009294	OMENTUM	-	3b	-	10.8 x 16	NIL	NIL	NIL	NIL	2	2	3	NO
34	1006827	SMALL BOWEL	2	3b	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	2	5	NO
35	643385	OMENTUM	2	2	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	2	NO
36	1017911	-	3b	-	10.8 x 16	-	NIL	CHRONIC PAIN	NIL	NIL	1	1	3	NO
37	993210	OMENTUM	3b	3b	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	2	2	5	NO
38	501063	OMENTUM	2	1	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	1	4	NO
39	1029126	-	3b	-	12.2 x 17	-	NIL	NIL	NIL	NIL	1	1	3	NO
40	1029782	-	2	-	10.8 x 16	-	NIL	NIL	NIL	NIL	2	2	4	NO
41	1016897	-	3b	-	10.8 x 16	-	NIL	NIL	NIL	NIL	1	2	4	NO
42	1035875	SMALL BOWEL	3b	3b	12.2 x 17	12.2 x 17	NIL	NIL	NIL	NIL	1	1	3	NO
43	1036351	SIGMOID	-	3b	-	12.2 x 17	NIL	NIL	NIL	NIL	1	2	3	NO
44	1036152	-	3b	-	12.2 x 17	-	NIL	NIL	NIL	NIL	2	2	4	NO
45	519501	SIGMOID	-	3b	-	12.2 x 17	NIL	SEROMA	NIL	NIL	2	3	3	NO
46	895021	OMENTUM	2	2	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	1	2	4	NO
47	1014292	-	2	-	10.8 x 16	-	NIL	NIL	NIL	NIL	1	1	2	NO
48	1064800	OMENTUM	2	1	10.8 x 16	10.8 x 16	NIL	NIL	NIL	NIL	0	1	2	NO
49	481526	SIGMOID	3b	3b	12.2 x 17	12.2 x 17	NIL	SEROMA, CHRONIC PAIN	NIL	NIL	2	4	3	NO
50	335451	-	2	-	10.8 x 16	-	NIL	NIL	NIL	NIL	2	3	3	NO

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No. BFUHS/2K21p-TH/ 5056

Date 20/1/2021

The Principal,
DMC,Ludhiana.

Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 22.01.2021 has approved the plan of thesis of **Dr. Shubham Vasudeva,** a student of your college for **MS General Surgery** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Evaluation of etep (extended totally extra-peritoneal approach) approach in inguinal hernia repair

Supervisor
Dr. Atul Mishra
Prof.,
Dept. of Surgery,
DMCH, Ludhiana.

Co-Supervisor
Dr. Ravinder Pal Singh
Prof.,
Dept. of Surgery,
DMCH, Ludhiana.

Dr. Amandeep Singh Nar
Assoc. Prof.,
Dept. of Surgery,

The student has to submit the three copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

S P Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

1-8)

1. ***If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.***
2. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

EVALUATION OF eTEP (EXTENDED TOTALLY EXTRA-PERITONEAL) APPROACH IN INGUINAL HERNIA REPAIR

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF SURGERY

IN

GENERAL SURGERY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

NOVEMBER 2019

DR. SHUBHAM VASUDEVA

DEPARTMENT OF GENERAL SURGERY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	EVALUATION OF eTEP (EXTENDED TOTALLY EXTRA-PERITONEAL APPROACH) APPROACH IN INGUINAL HERNIA REPAIR
For the degree of	M.S. General Surgery
Name of the candidate	Dr. Shubham Vasudeva
Supervisor	Dr. Atul Mishra, Professor, Department of Surgery
Co-supervisor	Dr. Ravinder Pal Singh, Professor, Department of Surgery Dr. Amandeep Singh Nar, Associate Professor, Department of Surgery
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: eTEP (Extended Totally Extraperitoneal) repair, is a modification of the TEP approach where the camera port is placed away from the hernia site, most commonly in the paraumbilical hernia on side of hernia or on either side in case of B/L hernia which provides an extended view of the space and overcomes the limitation of TEP repair which provides limited space for dissection and sectorisation

Aim of Study: To study the efficacy, safety, outcome and complications of eTEP approach in repair of inguinal hernia

Materials & methods: The study will include a minimum of 30 cases of inguinal hernia presenting to Dayanand Medical College and Hospital, Ludhiana

Clinical Significance: This study will be helpful in knowning the advantages and disadvantage of eTEP approach especially the intra-op complications, conversion to open rates, peritoneal breach, and post-op recovery period and need for post-op analgesics

(Signature)	(Signature)	(Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"EVALUATION OF eTEP (EXTENDED TOTALLY EXTRA-PERITONEAL APPROACH) APPROACH IN INGUINAL HERNIA REPAIR"** exist in the Department of General Surgery, DMC&H, Ludhiana and will be provided to be candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate himself/herself under our supervision and guidance.

Supervisor

Dr. Atul Mishra
Professor
Department of Surgery
DMCH, Ludhiana

Co-Supervisor(s)

Dr. Ravinder Pal Singh
Professor
Department of Surgery
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Dr Amandeep Singh Nar
Associate Professor
Department of Surgery
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HEAD OF DEPARTMENT

Dr. JASPAL SINGH
Professor and Head
Department of Surgery
DMCH, Ludhiana

Place: _____

Date: _____

APPROVAL PROFORMA
BY RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	DR. SHUBHAM VASUDEVA
Department	SURGERY
Topic of Thesis	EVALUATION OF eTEP (EXTENDED TOTALLY EXTRA-PERITONEAL APPROACH) APPROACH IN INGUINAL HERNIA REPAIR
Likely date of appearing in PG examination	MAY/JUNE 2022
Date of enrollment	MAY 04,2019
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Approved: Yes / ~~No~~

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Approved: Yes / ~~No~~

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BABA FARID UNIVERSITY OF HEALTH SCIENCES, FARIDKOT

PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	Dr. Shubham Vasudeva Post-graduate Student, Department of GENERAL SURGERY, Dayanand Medical College and Hospital, Ludhiana
2	NAME OF THE INSTITUTE	Dayanand Medical College and Hospital
3	COURSE OF STUDY AND SUBJECT	M.S. GENERAL SURGERY
4	DATE OF ADMISSION OF COURSE	04 MAY,2019
5	TITLE OF THE TOPIC	EVALUATION OF eTEP (EXTENDED TOTALLY EXTRA-PERITONEAL APPROACH) APPROACH IN INGUINAL HERNIA REPAIR

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

Five laparoscopic techniques are currently available for repairing an inguinal hernia: totally extraperitoneal (TEP) repair, extended view totally extraperitoneal (eTEP), transabdominal preperitoneal (TAPP), intra-peritoneal onlay mesh (IPOM), and reduction of the sac with or without closure of the ring.

The classical TEP technique is the laparoscopic technique considered closest to ideal for inguinal hernia repair, but the technique has several drawbacks such as limited space for dissection and mesh placement, restricted port placement, a low tolerance of accidental pneumoperitoneum, and long learning curve as compared to other minimal access surgeries. These disadvantages may explain the low implementation of the technique outside the circle of experts. We describe an extended-view modification, the eTEP technique, which overcomes several of these drawbacks. The eTEP technique is based on the premise that the extraperitoneal space can be reached from almost anywhere in the anterior abdominal wall. The eTEP approach can quickly and easily create an extraperitoneal space, enlarge the surgical field, provide a flexible port setup adaptable to many situations, allow unencumbered parietalization of the cord structures (proximal dissection of the sac and peritoneum), ease the management of the distal sac in cases of large inguinoscrotal hernias, and improve tolerance of pneumoperitoneum, which is a common complication. By avoiding to enter the peritoneum, there is reduced risk of bowel and vascular injury, no postoperative adhesions and the advantages of lower recurrence and complication rates with an overall better outcome. We believe that the eTEP technique has a place in the armamentarium of the hernia surgeon. Residents and surgeons in training will find this technique easier to master. The eTEP can expand the traditional indications of the extraperitoneal approach to patients with difficult body habitus, a short umbilicus-pubis and spino-umbilical distance, and previous pelvic surgery, and as experience is gained, the indications for traditional TEP can expand to more complex cases.

The most salient features of the eTEP technique are:

1. Fast and easy creation of the extraperitoneal space.
2. A large surgical field.
3. A flexible port setup adaptable to many clinical situations.
4. Unencumbered parietalization of the cord structures (proximal dissection of the sac and peritoneum).
5. Easier management of the distal sac in cases of large inguinoscrotal hernias
6. Improved tolerance of pneumoperitoneum, which is a common complication.

Etep approach is widely is used in repair of large and complex ventral hernias with less complications, less post operative pain, early recovery and early return to work. As the patient gets out of bed early in post-operative period, it decreases the risk of complications associated with prolonged immobility like pneumonia, deep vein thrombosis. As it is clearly demonstrated that eTEP approach is superior as compared to other endoscopic surgeries in repair of ventral hernias. Therefore extending eTEP approach in repair of large/complex inguinal hernias can be revolutionary.

6.2 REVIEW OF LITERATURE

Jorge Daes, in the study "Minimally Invasive Surgical Techniques for Inguinal Hernia Repair: The Extended-View Totally Extraperitoneal Approach (eTEP)" stated that the extended-view totally extraperitoneal (eTEP) technique has evolved as a way to compensate for the disadvantages of working within a limited space. The eTEP technique is based on a better understanding of the abdominal wall anatomy and the notion that the extraperitoneal space is limitless once the confluence of the arcuate arch and semilunar line is taken down.[1]

C. G. Schmedt, in the study "Comparison of endoscopic procedures vs Lichtenstein and other open mesh techniques for inguinal hernia repair a meta-analysis of randomized controlled trials" stated that for the scientific evaluation of the endoscopic and open mesh techniques for the repair of inguinal hernia, meta-analyses of randomized controlled trials (RCT) are necessary. The Lichtenstein repair is one of the most common open mesh techniques and therefore of special interest. After an extensive search of the literature and a quality assessment, a total of 34 RCT comparing endoscopic procedures both transabdominal preperitoneal (TAPP) and total extraperitoneal (TEP)—with various open mesh repairs were deemed to be suitable for a formal meta-analysis of the relevant parameters. These studies included data for 7,223 patients. Trials that used the Lichtenstein repair for the control group were analyzed-separately. It resulted in significant advantages for the endoscopic procedures compared with the Lichtenstein repair include a lower incidence of wound infection, a reduction in hematoma formation and nerve injury, an earlier return to normal activities or work, and fewer incidences of chronic pain syndrome. The conclusion came that Endoscopic repairs do have advantages interms of local complications and pain-associated parameters.[2]

Kirsty McCormack , in the study "Laparoscopic techniques versus open techniques for inguinal hernia repair" stated that Inguinal hernia repair is the most frequently performed operation in general surgery. The standard method for inguinal hernia repair had changed little over a hundred years until the introduction of synthetic mesh. This mesh can be

placed by either using an open approach or by using a minimal access laparoscopic technique. Forty-one eligible trials of laparoscopic versus open groin hernia repair were identified involving 7161 participants (with individual patient data available for 4165). Meta-analysis was performed, using individual patient data where possible. Operation times for laparoscopic repair were longer and there was a higher risk of rare serious complications. Return to usual activities was faster, and there was less persisting pain and numbness. Hernia recurrence was less common than after open non-mesh repair but not different to open mesh methods. The review showed that laparoscopic repair takes longer and has a more serious complication rate in respect of visceral (especially bladder) and vascular injuries, but recovery is quicker with less persisting pain and numbness. Reduced hernia recurrence of around 30-50% was related to the use of mesh rather than the method of mesh placement.[3]

Wake BL, conducted a study "Transabdominal pre-peritoneal (TAPP) vs totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair" which stated that The choice of approach to the laparoscopic repair of inguinal hernia is controversial. This study included all published and unpublished randomised controlled trials and quasi-randomised controlled trials comparing laparoscopic TAPP with laparoscopic TEP for inguinal hernia repair were eligible for inclusion. Non-randomised prospective studies were also eligible for inclusion to provide further comparative evidence of complications and adverse events. The search identified eight non-randomised studies suggest that TAPP is associated with higher rates of port-site hernias and visceral injuries whilst there appear to be more conversions with TEP. Vascular injuries and deep/mesh infections were rare and there was no obvious difference between the groups.[4]

Mahesh C. Misra , in the study "Massive Scrotal Hernias: Problems and Solutions" stated that Massive incarcerated scrotal hernias are usually managed by an open method. Some experienced surgeons have successfully attempted laparoscopic management of such cases. Total

extraperitoneal repair (TEP) is the laparoscopic technique of choice for the repair of groin hernia. Many authors have suggested that transabdominal preperitoneal (TAPP) is the preferred approach to these hernias. The purpose of this study is to show our results of TEP repair of giant scrotal hernias. In the present study a total of 21 (20 patients) out of 291 groin hernias (185 patients) were included and evaluated prospectively. TEP was successful in 14 (66.6%) with a conversion to TAPP in 4 (19.04%) and open procedure in 3 (14.28%) cases, respectively. Postoperative complications included scrotal hematoma in 5 (25%), spermatic cord edema in 6 (30%), and seroma in 14 (70%) patients. There was no recurrence of hernia noticed during mean follow-up of 36 months. Laparoscopic TEP repair was successful with excellent outcome in the management of massive incarcerated groin hernia in the hands of an experienced laparoscopic surgeon.[5]

B. J. Leibl, conducted a study "Laparoscopic hernia repair—TAPP or/and TEP?" included various endoscopic hernia repair procedures, TAPP and TEP have been selected for routine use. Results from Medline research were analysed. The results showed that there is a similar risk for postoperative morbidity for both techniques. The recurrence rate in large single-centre series is between 0% and 3.4%. There were numerous indications for both procedures, whereby a transperitoneal TAPP can also be applied in cases of previous preperitoneal operations. Randomised trials comparing both methods of hernia repair are lacking. Seven non-randomised studies showed no differences in recurrence rate and morbidity. In general the learning curve for is shorter in favour of TAPP repair.[6]

G. Ferzli, conducted a study "The feasibility of laparoscopic extraperitoneal hernia repair under local anesthesia" which stated that Laparoscopic preperitoneal herniorrhaphy has the advantage of being a minimally invasive procedure with a recurrence rate comparable to open preperitoneal repair. However, surgeons have been reluctant to adopt this procedure because it requires general anesthesia. In this report, we describe the technique used in the laparoscopic repair of inguinal hernias under local anesthesia using the preperitoneal approach. We

also report our results with 10 inguinal hernias repaired using the same technique. Ten patients underwent their primary inguinal hernia repairs under local anesthesia. None were converted to general anesthesia. Four patients received a small amount of intravenous sedation. Three patients had bilateral hernias. There were five direct and eight indirect hernias. The average operative time was 47 min. The average lidocaine usage was 28 cc. All patients were discharged within a few hours of the surgery. There were no complications/recurrances. The extraperitoneal laparoscopic repair of inguinal hernia is feasible under local anesthesia. This technique adds a new treatment option in the management of bilateral inguinal hernias, particularly in the population where general anesthesia is contraindicated or even for patients who are reluctant to receive general or epidural anesthesia.[7]

M. Ismail , conducted a study "Laparoscopic inguinal total extraperitoneal hernia repair under spinal anesthesia without mesh fixation in 1,220 hernia repairs " which stated that The need for general anesthesia and the cost and pain due to metal staples required for fixing the mesh are the major reported disadvantages of laparoscopic total extraperitoneal (TEP) hernia repair. We studied the feasibility and results of TEP done under spinal anesthesia with non-fixation of the mesh (SA-NF). This group was compared to TEP done under general anesthesia with non-fixation of the mesh (GA-NF) and repairs done under SA with fixation of the mesh (SA-F). The recurrence rates, conversion rates, and complications were similar in all three groups. The mean hospital stay, days to resume normal activities, and pain scores were significantly higher in the mesh fixation (SA-F) group. TEP, done under SA and without fixation of the mesh, is safe, feasible, and associated with low recurrence rates. Since this procedure does not have the disadvantages usually attributed to TEP, it can be possibly recommended as a first-line procedure, even for unilateral inguinal hernias.[8]

Jorge Daes, conducted a study "The enhanced view–totally extraperitoneal technique for repair of inguinal hernia" stating The totally extraperitoneal (TEP) approach for repair of inguinal hernia is the preferred technique since it does not penetrate the peritoneal cavity,

thus avoiding potential intraperitoneal complications. The TEP technique allows for regional or even local plus sedative anesthesia, and it gives us an incomparable view of the inguinal region and hernias exactly where they originate. Part of the difficulty with the TEP technique is the limited space it provides for dissection. He describe a modification of the classical TEP approach which overcomes this limitation: the e-TEP technique.[9]

J. Daes, conducted the study of Endoscopic repair of large inguinoscrotal hernias: management of the distal sac to avoid seroma formation stating the best approaches to repairing large inguinoscrotal hernias and handling of the distal sac are still debated. Complete dissection of a distal sac which extends deep into the scrotum carries a risk of orchitis and damage to the cord structures. However, failure to deal with the distal sac often results in the formation of a large and bothersome seroma or pseudohydrocele. We describe a technique for managing large distal sacs to avoid clinically important seromas when repairing large inguinoscrotal hernias, using the enhanced view totally extraperitoneal (e-TEP) endoscopic technique. From October 2010 to November 2011, 94 consecutive elective hernia repairs were performed using the e-TEP technique. Six of these patients had large inguinoscrotal hernias, defined as hernias extending deep into the scrotum with a distal sac not amenable to dissection. In these six patients, we managed the distal sac by pulling it out of the scrotum and fixing it high and laterally to the posterior inguinal wall. We prospectively followed these patients and examined them at 8 days and 1 and 3 months postoperatively, looking specifically for signs or symptoms of seroma. Ultrasonography was performed at each follow-up visit.Only one of the patients had developed a seroma by the eighth postoperative day. The seroma was drained and did not recur or produce symptoms during the following 3 months. There were no major complications or early recurrences in the series. Patients with large inguinoscrotal hernias and sacs extending deep into the scrotum can benefit from reduction and fixation of the distal sac high and laterally to the posterior inguinal

B Todd Heniford, conducted a studied "Laparoscopic Repair of Ventral Hernias" which evaluated the efficacy and safety of laparoscopic repair of ventral hernias. The recurrence rate after standard repair of ventral hernias may be as high as 12-52%, and the wide surgical dissection required often results in wound complications. Use of a laparoscopic approach may decrease rates of complications and recurrence after ventral hernia repair.[14]

A. Tandon, conducted a study "Meta-analysis of closure of the fascial defect during laparoscopic incisional and ventral hernia repair" which stated that laparoscopic incisional and ventral hernia repair (LIVHR) is being used increasingly, with reported outcomes equivalent to those of open hernia repair. Closure of the fascial defect (CFD) is a technique that may reduce seroma formation and bulging after LIVHR. Non-closure of the fascial defect makes the repair of larger defects easier and reduces postoperative pain.[15]

Yuri W.Novitsky, conducted a study "Transversus abdominis muscle release: a novel approach to posterior component separation during complex abdominal wall reconstruction" which stated that several modifications of the classic retromuscular Stoppa technique to facilitate dissection beyond the lateral border of the rectus sheath recently were reported. Our novel technique for posterior component separation was associated with a low perioperative morbidity and a low recurrence rate. Overall, transversus abdominis muscle release may be an important addition to the armamentarium of surgeons undertaking major abdominal wall reconstructions.[16]

Mark F. Berry, conducted a study "Repair of large complex recurrent incisional hernias with retromuscular mesh and panniculectomy" which stated that Recurrent incisional hernia repair is associated with high recurrence and wound complication rates. The clinical courses of patients who underwent recurrent incisional hernia repair via retromuscular mesh placement with concomitant panniculectomy at a university teaching hospital from 1999 to 2004 were reviewed retrospectively. All patients rated the postoperative appearance of their abdomen as at least satisfactory.[17]

6.3 AIMS AND OBJECTIVES

To study the efficacy, safety, outcome and complications of eTEP approach in repair of inguinal hernia.

To analyze the complications, immediate as well as long term, and outcomes; in eTEP repair of inguinal hernias

Short term:-

1. Conversion rate to open
2. Early complications- SSO
   - Port site complications/occurence
   - Seroma/ haematoma/ pseudohydrocele
3. Duration of hospital stay
4. Post – op pain

Long term:-

1. Recurrence at 3 months
2. seroma/hematoma/pseudohydrocele
3. Mesh infection
4. Chronic pain
5. Need for re-surgery/re-occurance

7.0 MATERIALS AND METHODS

Study Design - It is a prospective study, which will include a minimum of 50 cases of inguinal hernia presenting to DMCH

7.1 SOURCE OF DATA

Who are fit for minimal access Hernia surgery & consent to participate in the study presenting to Dayanand Medical College and Hospital, Ludhiana

7.2 METHOD OF COLLECTION OF DATA

Regular follow up will be done after 3 months; necessary investigations such as USG will be done when required.

Inclusion criteria: all patients with inguinal hernia presenting to DMCH OPD for endoscopic repair of hernia

Exclusion Criteria:

- ASA class IV or V (severe co-morbid conditions)
- Complicated hernias (obstructive: strangulated).
- loss of domain, ulcerated skin, active infection, orchitis

COMPLICATIONS ASSESSED

Short term:-

1. Conversion rate to open
2. Early complications- SSO

• Port site complications/occurence

• Seroma/ haematoma/ pseudohydrocele

3. Duration of hospital stay
4. Post – op pain

Long term:-

1. Recurrence at 3 months
2. seroma/hematoma/pseudohydrocele
3. Mesh infection
4. Chronic pain
5. Need for re-surgery/re-occurance

Duration of study: January,2020 to June, 2021

Outcome: To study the efficacy, safety, outcome and complications of eTEP approach in repair of inguinal hernia

Statistical analysis:

Data will be described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

Yes, patients presenting included in the study will have to undergo hematological, biochemical, radiological investigations. For this patients included in the study will be informed regarding their inclusion and written informed consent will be taken for all the patients included in the study. These are however, essential from the patient management and are a part of the routine protocol for the management for inguinal hernia.

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Attached Herewith

LIST OF REFERENCES

1. Daes J. Minimally Invasive Surgical Techniques For Inguinal Hernia Repair: The Extended-View Totally Extraperitoneal Approach (Etep). The SAGES Manual Of Hernia Surgery. 2018;45:449-60.
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1. Daes J. Minimally Invasive Surgical Techniques For Inguinal Hernia Repair: The Extended-View Totally Extraperitoneal Approach (Etep). The SAGES Manual Of Hernia Surgery. 2018;45:449-60.
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10. Daes J. Endoscopic repair of large inguinoscrotal hernias: management of the distal sac to avoid seroma formation. Hernia. 2014;18:119–22.
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EVALUATION OF eTEP(EXTENDED TOTALLY EXTRA-PERITONEAL) APPROACH IN INGUINAL HERNIA REPAIR
CASE-STUDY PERFORMA

S.NO.

NAME	AGE/SEX
MRD NO.	ADDRESS
DATE OF ADMISSION	DATE OF SURGERY
DATE OF DISCHARGE	CONTACT

CHIEF COMPLAINTS-

HISTORY OF PRESENTING ILLNESS-

PAST HISTORY

- COPD/ASTHMA
- CHRONIC CONSTIPATION
- H/O PREVIOUS LOWER ABDOMEN/PELVIC SURGERIES

PERSONAL HISTORY

- SMOKING
- ALCOHOL
- NICOTINE/OPOID

GENERAL PHYSICAL EXAMINATION

VITALS ON ADMISSION

HR	RR	BP	TEMP
BUILT	NUTRITION		GCS

SIGN OF CANDIDATE

SIGN OF SUPERVISOR:

EXAMINATION

PER ABDOMEN(ANY SCAR OVER ABDOMEN)

SWELLING

EXTENT

SIZE

SHAPE

REDUCIBLE/IRREDUCIBLE

IMPULSE ON COUGHING

SKIN OVER SWELLING

TEMP OVER SWELLING

TENDERNESS

OTHER SYSTEM EXAMINATION

CVS

RS

CNS

CLINICAL DIAGNOSIS

SIGN OF CANDIDATE **SIGN OF SUPERVISOR**

INVESTIGATIONS-

HEMOGLOBIN				
TLC				
PLATELETS				
PTI/INR				
B. UREA				
S. CREATININE				
B. SUGAR				
Na/K/Cl				

VIRAL MARKERS-

CHEST X-ray

IMAGING

OTHERS-

OPERATIVE DETAILS

DATE OF SURGERY

TYPE OF ANAESTHESIA

DURATION OF SURGERY

INTRA-OP FINDINGS

DEFECT SIZE

CONTENT

TYPE OF HERNIA(NYHUS)

TYPE AND SIZE OF MESH

NEED FOR CONVERSION TO OPEN

DRAINS

OTHER INTRA-OP COMPLICATIONS

SIGN OF CANDIDATE

SIGN OF SUPERVISOR:::

POST-OP DETAILS

ICU STAY

DURATION OF DRAIN

LENGTH OF STAY IN HOSPITAL(POST-OP)

POST-OP COMPLICATIONS

DURATION	2 WEEKS	1 MONTH	3 MONTHS
HEMATOMA/SEROMA/PSEUDOHYDROCELE			
SSI:			
PORT SITE OCCURRENCE			
BOWEL COMPLICATIONS			
NEED FOR RE-SURGERY			
MESH INFECTION			
RECURRENCE			
CHRONIC PAIN			

OTHERS

OUTCOME:

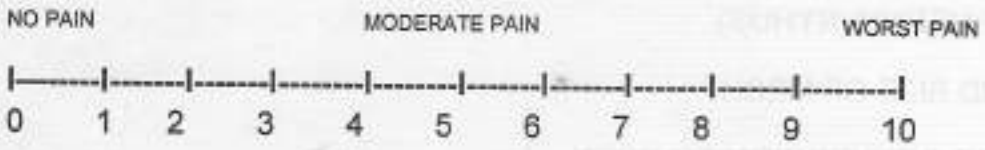
DAY OF MOBILIZATION

LENGTH OF HOSPITAL STAY (POST-OP) IN DAYS

SEVERITY OF PAIN(POD-1)

RECURRENCE(YES/NO)

VAS SCALE



SIGN OF CANDIDATE

SIGN OF SUPERVISOR

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o.....am willing to participate in the study **"EVALUATION OF eTEP APPROACH IN INGUINAL HERNIA REPAIR"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

....

Signature of the Witness Signature of the patient

Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य **"EVALUATION OF eTEP APPROACH IN INGUINAL HERNIA REPAIR"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

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गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"EVALUATION OF eTEP APPROACH IN INGUINAL HERNIA REPAIR" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

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ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

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ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

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ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ